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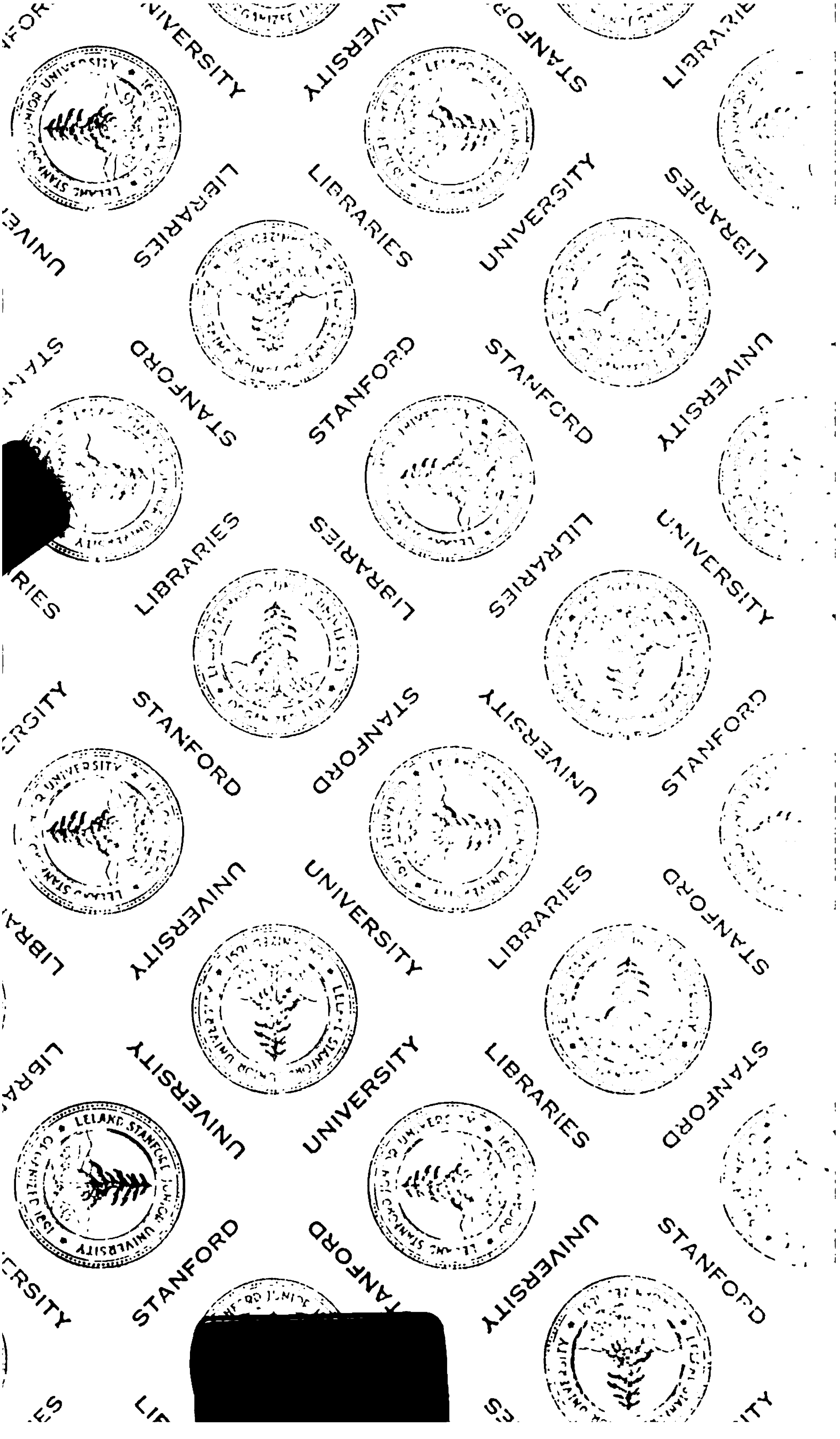
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FORTIFICATIONS BILL, 1918

MAR 31

HEARINGS

BEFORE SUBCOMMITTEE OF HOUSE COMMITTEE
ON APPROPRIATIONS

CONSISTING OF

MESSRS. SWAGAR SHERLEY, CHAIRMAN, GEORGE W. RAUCH,
JOHN J. EAGAN, FREDERICK H. GILLETT,
AND JAMES W. GOOD

IN CHARGE OF

THE FORTIFICATIONS
APPROPRIATION BILL

SIXTY-FOURTH CONGRESS
SECOND SESSION

WASHINGTON
GOVERNMENT PRINTING OFFICE
1916

FORTIFICATIONS APPROPRIATION BILL, 1918.

HEARINGS CONDUCTED BY THE SUBCOMMITTEE, MESSRS. SWAGAR SHERLEY (CHAIRMAN), GEORGE W. RAUCH, JOHN J. EAGAN, FREDERICK H. GILLETT, AND JAMES W. GOOD, OF THE COMMITTEE ON APPROPRIATIONS, HOUSE OF REPRESENTATIVES, IN CHARGE OF THE FORTIFICATIONS APPROPRIATION BILL, ON THE DAYS FOLLOWING, NAMELY:

SATURDAY, DECEMBER 9, 1916.

FORTIFICATIONS IN THE UNITED STATES AND INSULAR POSSESSIONS.

STATEMENT OF MAJ. GEN. ERASMUS M. WEAVER, CHIEF COAST ARTILLERY CORPS.

REPORT OF THE BOARD OF REVIEW.

Mr. SHERLEY. This is a hearing on the fortifications bill containing the estimates for the year 1918. Gen. Weaver, it might be well if you would briefly state the scope of the estimates submitted for this year, and whether or not they are in line with the policy which was outlined last year for carrying out recommendations made by a board of review which had reported on the entire seacoast defense; and if so, at what rate of progress it is contemplated to carry out those recommendations.

Gen. WEAVER. In February, 1915, the Secretary of War appointed a board designated as the War Department Board of Review to revise the projects of the National Coast Defense Board, and that revision formed the basis of the estimates presented to Congress for the fiscal year 1917, and the appropriations carried in the fortifications act for that year. The character and scope of that revision were explained fully in the hearings before the Fortifications Committee at the last session of Congress.

COAST DEFENSES IN THE UNITED STATES.

It may be said in brief that the more important features of that revision involve the installation at certain localities of armament of greater caliber and power than that heretofore installed; the provision of long-range 12-inch guns; the initiation of the construction of movable coast armament, and of antiaircraft guns; and the accumulation of an allowance of battle ammunition considerably in excess of the quantities formerly deemed adequate for a safe reserve.

The total additional armament for the continental United States included in the project of the Board of Review comprised twenty, two 16-inch guns, twenty-four 12-inch guns mounted on carriages admitting of high elevation and affording long range, twenty-three 6-inch guns, four 3-inch guns, forty-eight 16-inch mortars, one hundred and thirty-four 3-inch antiaircraft guns, and one experimental 14-inch railway gun or gun mounted on railway carriage, and six 16-inch railway howitzers.

INSULAR POSSESSIONS.

For the insular possessions it included eight 12-inch guns mounted for long-range fire and seventeen 3-inch antiaircraft guns; and for the Panama Canal it included four 16-inch guns, four 12-inch guns mounted for long-range fire, twelve 16-inch mortars, and eight 3-inch antiaircraft guns.

Mr. **Sherley**. General, in order that the record may show it, it is well to state here that this bill does not carry the appropriations for the Panama Canal.

Gen. **Weaver**. No; this bill does not. I included the canal only because it is one of the localities covered by the Board of Review's project.

The cost of carrying out the entire project of the Board of Review as estimated by the board involved an expenditure of about $71,000,000 for the continental United States, and about $11,000,000 for the insular possessions, for which localities appropriations are carried in the fortification acts; and also about $14,000,000 for Panama, for which appropriations are carried in the sundry civil acts.

Mr. **Sherley**. Making a total of about $96,000,000?

Gen. **Weaver**. Yes. The initial appropriations for the accomplishment of this plan were carried in the fortification act for 1917. Among the more important items covered by the appropriations contained in that act for continental United States were: For Engineer construction—amount for the acquisition of sites for fortifications at Rockaway Beach and San Francisco; for the completion of the fortification work in progress at Los Angeles; for the initiation of battery construction at Cape Henry; and for six emplacements for 12-inch guns mounted for long-range fire. For ordnance construction, four 16-inch and four 6-inch guns and carriages for Cape Henry, and two 16-inch guns and carriages for Rockaway Beach: 17 carriages for 12-inch guns to be mounted for long-range fire; fifty-four 3-inch antiaircraft guns; one 16-inch railway howitzer; one 14-inch railway rifle; and an increase in the supply of reserve ammunition.

For the insular possessions, it included the construction of eight carriages for 12-inch guns to be mounted for long-range fire; and ten 3-inch antiaircraft guns; and an increase in the ammunition supply

UNITED STATES.

The estimates for seacoast fortifications for 1918 are intended in general to cover one-third the balance remaining to be appropriated to carry out the four-year program of the Board of Review, and also to cover items of maintenance and a few items of new construction not included in the original program and estimates of the Board o Review. The unit estimates of cost that form the basis of the 191 estimates for armament and ammunition are 25 per cent and 20 per cent, respectively, greater than the unit costs used in computing the estimates of the board of review for those items. This is on account of the increased cost of materials. The more important items included in these estimates are, for the continental United States, first, the completion of battery construction at Cape Henry and the initiation of battery construction at Rockaway Beach; second, the construction of batteries for eighteen 12-inch guns arranged for long-range fire, which is the total number remaining to be completed for continental United States under the project of the board of review; third, the acquisition of a site for the proposed long-range guns for Delaware Bay, and of sites for two 16-inch guns and two 12-inch rifles in Boston Harbor; fourth, the construction of the armament for eight 16-inch mortars for Cape Henry and for eight 16-inch mortars and two 16-inch guns for Rockaway Beach; two 16-inch guns for Puget Sound; four 6-inch guns for Rockaway Beach; 2 barbette carriages for 12-inch guns for Boston Harbor; $733,000 for the construction of the turret at Fort Michie at The Race at the eastern entrance to Long Island Sound; two all-round fire carriages for 12-inch guns for Fort Sumter, Charleston, and four 16-inch railway howitzers, four 14-inch railway rifles, six 12-inch railway howitzers, and eighty 3-inch antiaircraft guns; one-third of the balance remaining to complete the supply of reserve ammunition; the provision of submarine-mine material for Los Angeles Harbor; and amounts for fire control, searchlights, power plants, and submarine-mine structures.

INSULAR POSSESSIONS.

For the insular possessions, the construction of emplacements for six 12-inch long-range guns on Oahu; the construction of two 12-inch railway howitzers and seven 3-inch antiaircraft guns; and one-third of the balance of the reserve ammunition remaining to be accumulated for the fortifications in the insular possessions.

Mr. **Sherley**. General, while the estimates contemplate appropriations sufficient to complete one-third of the three-fourths of the project not yet appropriated for, the actual amount asked is more, is it not, than one-third, due to an estimated increase of cost?

INCREASED COST OF MATERIAL.

Gen. **Weaver**. One-third of the unappropriated balance of the estimated cost of the project of the Board of Review for continental United States and their insular possessions is $28,421,419. The estimates for cash appropriations for seacoast fortifications in the 1918 estimates for the United States and insular possesisons aggregate $28,492,971.21. The total of the contract authorizations requested for 1918 for such fortifications is $5,259,000, making the grand total of the 1918 estimates $33,751,971.21. This latter amount exceeds one-third the unappropriated balance of the project of the Board of Review, $28,421,419, by $5,330,552.21, which excess is due to the following: A 25 per cent increase in the cost of materials for armament, amounting to $1,533,000; a 20 per cent increase in the cost of materials for ammunition, amounting to $2,029,000; estimates for additional movable railway armament amounting to $1,700,000; and a few items of new construction, not included in the Board of Review project. The 1918 estimates include $150,000 for two all-around fire carriages for 12-inch guns for Fort Sumter, Charleston——

Mr. SHERLEY (interposing). Were they not originally included.

Gen. WEAVER. No; they were not included in the original project of the Board of Review, but they have since been included, and an estimate for their construction has been incorporated in the 1918 estimates in substitution for a like amount included in the original project of the board for other purposes.

Mr. SHERLEY. They are really a substitution then for what was proposed at Charleston?

Gen. WEAVER. They are a substitution for existing armament. The items of new construction which make up the balance of the excess just referred to, include roads, water and sewer systems for fortification, $40,000; filling in at Fort De Russy Reservation, $54,000; widening the tunnel at Diamond Head, on the Island of Oahu, $40,000; and an additional estimate for land defenses on Oahu, $225,000. These items make a total of $5,621,000.

Mr. SHERLEY. If that ratio of increased cost would continue, there will be approximately about $15,000,000 more necessary to carry out the Board of Review's scheme, making a total of about $110,000,000 in place of $96,000,000.

Gen. WEAVER. Yes; if the recent increase in the cost of materials is found to be permanent.

SATURDAY, DECEMBER 9, 1916.

STATEMENT OF BRIG. GEN. WILLIAM M. BLACK, CHIEF OF ENGINEERS, ACCOMPANIED BY LIEUT. COL. E. EVELETH WINSLOW, ASSISTANT.

CONSTRUCTION OF GUN AND MORTAR BATTERIES IN UNITED STATES—UNEXPENDED BALANCES.

Mr. SHERLEY. The first item in which the Engineer Department is interested is found on page 2 of the bill "For construction of gun and mortar batteries, $3,675,000." Last year for similar purposes there was asked $2,533,000, and there was appropriated $2,300,000. What is the state of your balances?

Col. WINSLOW. At the present time—that is, of the date of October 31, which is the last date for which monthly reports have been received—there remained unexpended in the hands of the district officers $398,000. There was unallotted $2,128,000, but that amount was pledged for various work—for the batteries at Cape Henry, for the completion of the Los Angeles project, for the emplacement of 6 long-range guns, and for 54 antiaircraft-gun emplacements.

Mr. SHERLEY. Last year at the time the estimates were submitted it was testified that with the moneys then on hand and with that which was being asked for it was contemplated, as I recall, to finish the emplacement work at San Pedro, at San Diego, to start upon the emplacement work at Cape Henry, to build the emplacements for seven 12-inch guns to be mounted for high-angle fire, and, if the situation touching the acquisition of land warranted it, the doing of some emplacement work at Rockaway Beach and the building of the emplacements for a given number antiaircraft guns. Is that right, Colonel?

Col. **Winslow**. That is substantially so.

Mr. **Sherley**. What else was contemplated?

SAN PEDRO, CAL.

(See pp. 31, 100, 155.)

Col. **Winslow**. It was not contemplated to complete the work at San Pedro, but to complete it with the exception of a 3-inch battery, estimated to cost $50,000. This was not included in the estimates as submitted. Otherwise you are correct.

Mr. **Sherley**. Was any other work contemplated which I have not enumerated?

Col. **Winslow**. No, sir.

Mr. **Sherley**. You also testified that it was contemplated you would finish your work at San Pedro in the summer of 1917.

Col. **Winslow**. Yes; with the exception of the 3-inch battery.

Mr. **Sherley**. What is the condition as to the physical work at San Pedro now?

Col. **Winslow**. The mortar battery is having its guns mounted. It is practically completed. The concrete work is well under way in both 14-inch batteries, as you will see by these photographs.

Here is a photograph of the mortar battery showing the condition, with the carriages being mounted. You can see the grading is about completed and that sodding is going on. Here are pictures of two ends of one of the 14-inch batteries showing the work around the gun platforms, practically completed, and of the other battery showing all concrete work well under way.

Mr. **Gillett**. Where is that?

Col. **Winslow**. This is at San Pedro. These photographs were all taken shortly before the 1st of November.

Mr. **Sherley**. You therefore expect to complete the work within the time you indicated last year?

Col. **Winslow**. Yes, sir.

Mr. **Sherley**. Will you do a little better than that?

Col. **Winslow**. We said in the summer, which was an indefinite period. We will have the batteries practically completed by the early summer.

Mr. **Sherley**. How are your costs showing up?

Col. **Winslow**. We expect to make a saving on the cost in spite of the increase in the cost of materials.

Mr. **Sherley**. Of what amount?

Col. **Winslow**. We do not like to say, but it will be something.

Mr. **Sherley**. Will it be enough to more than say it is a saving?

Col. **Winslow**. I think it is going to be enough to more than say it is a saving. There still remains a considerable part of the estimated cost that the district officer has not yet asked for, and he feels confident that it will not be necessary to ask for all of this.

Mr. SHERLEY. Have you in this year's estimate an estimate for the emplacement for the 3-inch gun battery?

Col. WINSLOW. We have not.

Mr. SHERLEY. Why not?

Col. WINSLOW. The site selected for the 3-inch gun battery at San Pedro is in the harbor on an area which was to be filled by the deposit of material dredged from the harbor by river and harbor work, and that work has not yet been entirely completed. The matter was taken to the Board of Review, and the Board of Review decided it would be better for many reasons, at least for the present, to depend to a certain extent upon movable armament for light defense of that locality. It was directed however that the 3-inch guns and carriages should be sent out to that fort and should be kept there, so that they could be emplaced very quickly in case of an emergency. It was decided that, for the present and until all the fill around the harbor had been completed and had had an opportunity to settle, it was not wise to build the battery.

Mr. SHERLEY. So that under present conditions you have received all of the moneys requisite for the completion of the engineering work in connection with the fortifications at San Pedro?

Col. WINSLOW. In connection with the battery construction, yes: but not all fortification work, because there are other engineering estimates in connection with the fortifications.

Mr. SHERLEY. I mean emplacement work.

Col. WINSLOW. Yes, sir.

SAN DIEGO, CAL.

(See pp. 50, 100.)

Mr. SHERLEY. What is the condition now at San Diego?

Col. WINSLOW. At San Diego the batteries to all intents and purposes have been completed, with the exception of some slight grading.

Mr. SHERLEY. Are the guns mounted?

Col. WINSLOW. No, sir; because they have not yet been received.

Mr. SHERLEY. How long have those emplacements been ready?

Col. WINSLOW. They are just being finished now. You can see that they were doing some grading work at the time this photograph was taken, which was the latter part of October. The exact date is on the back of the picture.

Mr. SHERLEY. As I recall, the mortars that are to go in these emplacements are to be transferred from the East and are therefore already in existence?

Col. WINSLOW. Yes.

Mr. SHERLEY. And there should be no delay in mounting them?

Col. WINSLOW. No, sir.

Mr. SHERLEY. Have you any idea as to when you will be ready to receive those mortars?

Col. WINSLOW. We are ready to receive them now.

Mr. SHERLEY. Then it is a matter with the Ordnance Department?

Col. WINSLOW. Rather for other branches of the War Department as to how soon we get those guns there to mount.

Mr. SHERLEY. And there are no other estimates submitted or contemplated in connection with the emplacement work at San Diego?

Col. WINSLOW. No immediate construction in connection with the emplacement work at San Diego. There is a question of getting some roads built that are to lead to one of those batteries. There is an estimate which will come in later for water supply, sewerage, and road construction work at San Diego. This ordinarily would be covered by the estimates of the Quartermaster Department, but the Engineer Department was directed to put in the estimate for that particular place.

Mr. **Sherley.** As I recall, when I went there there was quite a fine roadway going out to a point that passes within a few hundred feet of where this battery is.

Col. **Winslow.** That roadway is right on the top of the crest of the ridge, and anyone going along it is silhouetted against the sky to an observer on a ship. Further, in order for troops from the post to get to this battery they will have to climb up a very steep hill to the top of this ridge and then go along the ridge and come down to the site of the battery, which is in a hollow. It is now proposed to run a road along on a lower level from the post to this battery.

Mr. **Sherley.** How far is that from the post?

Col. **Winslow.** It is about a half mile.

Gen. **Black.** It does not amount to very much.

Col. **Winslow.** No, sir; it does not amount to very much.

Gen. **Black.** The division of the work between the Quartermaster's Department and the Engineer Department was agreed upon as follows: That the roads that were necessary for the garrison and for the upkeep of the garrison were the quartermaster's work, and that those roads which were strictly a part of the military construction for the service of the batteries would be constructed by the engineers and that in connection with the sewerage and water supply—the parts of the sewerage and water supply necessary for garrison purposes—were to be the quartermaster's portion, and that the engineer's portion would be that which related purely to the service of the batteries.

Mr. **Sherley.** What do you want to do with your sewage—use a septic tank?

Gen. **Black.** No; it is not absolutely necessary. At San Diego we have that great big bay to put it into, and the sewers can run right down hill into the bay.

Mr. **Sherley.** The city's sewerage system does not extend that far out?

Gen. **Black.** No, sir.

Mr. **Sherley.** The building is going on pretty close to that—the city building?

Gen. **Black.** Well, I do not think there will be any difficulty about that, and even if there should be difficulty, it would be a very small matter to put in a septic tank later.

CAPE HENRY.

(See pp. 19, 66, 114, 187.)

Mr. **Sherley.** What have you done in the way of work at Cape Henry, Colonel?

Col. **Winslow.** No work has actually been begun at Cape Henry yet. The first thing to be done there is, of course, the construction of a wharf, and the plans for that have been prepared; they have been under careful consideration and are now about ready for formal completion. The district officer has prepared specifications so as to advertise for proposals. He will be here this coming week to talk over some of the details of those specifications with the Chief of Engineers. So the work on the wharf is about ready to be put under contract.

Mr. SHERLEY. Is not this a rather unusual delay?

Col. WINSLOW. Then there are other reasons why work has not been begun there. One is the same old question of the right of way. When the land was purchased at Cape Henry the plots on file in the county records showed that certain streets were marked on the plots. We were given to understand that there would be no difficulty about getting authority to use these streets, but when the question came up about the actual use of them it was pointed out that these streets had never been formally dedicated to the public use and that the ownership of the land under the streets was still in the syndicate. This caused considerable complication before we could finally get permission to grade the streets and build the railroad. This matter, however, has just about been cleared up. Then there is another matter which came up. From the end of these streets, as shown on the plots, to the wharf there was included in the land condemned, a right of way. It was decided afterwards, however, by the Judge Advocate General that as the District Attorney in drawing up the decree of the court did not state specifically that this right of way was for railroad purposes, it could not be used for railroad purposes. So we had to get a new quit-claim from the people who had owned this land before we could use it as a right of way for railroad purposes.

Mr. SHERLEY. What I am trying to find out is the cause of the delay in beginning work. Last year, in going over the estimates submitted, when it was suggested that perhaps you gentlemen did not need all the money that you were asking for, particularly in view of the fact that there would be a new law passed by the 4th of March, 1917, we were urged to supply the funds because of the fact that the department did propose to expend all of this money at Cape Henry and, accordingly, we strained our consciences and gave you a very large sum. Now we are met with the statement that none of it has been expended.

Col. WINSLOW. There are other reasons.

Mr. SHERLEY. We would like to know about all of them.

Col. WINSLOW. Right through the sites of the principal batteries there now runs the Norfolk Southern Railway, and that track has to be moved. At the time the condemnation proceedings were under way the officials of the Norfolk Southern Railway Co. stated that in view of the additional traffic that would come to their road by the location of the post at that site the railroad company would deed to the United States the land that they owned (because they actually owned in fee their right of way), provided the Secretary of War would give the railroad a right of way somewhere else on the reservation and that the United States would stand the cost of removing the tracks. This seemed perfectly fair and was accepted, and an agreement was drawn up and was signed by the officials of the railway company and by the representative of the War Department.

The law officers of the Government, however, decided that this new right of way, being perpetual, could not be granted by the Secretary of War without congressional action. Congress was asked to give that authority, and Congress did give that authority. The form of agreement which had been drawn up was then sent down to the local officer for ratification by the officials of the railroad company, and this they were ready to do.

However, the trustees of the mortgages of the railway company refused to sign, and in spite of the negotiations that have been going on ever since, the railway company has been unable to get the deed ratified, because of the trustees who control the mortgages on the road. The consequence is that we finally came to the conclusion that we could not get it ratified and the local officer and the district attorney have been directed to enter condemnation proceedings for the right of way belonging to the railway company.

Mr. Sherley. The result of that will be that you will have to buy that strip which the railway company offered to give to you?

Col. Winslow. We hope not, because the official papers in the case show that the railway officials consider that the granting by the Secretary of War of a permanent right of way across the land, and the agreement to bear the cost of changing the site of the road, was a proper compensation for this present right of way. This is to be put in evidence before the court and we are hoping the decree of the court will practically say that if the Government will do this it will be considered sufficient pay for the right of way.

Mr. Sherley. Has it been determined that by condemnation proceedings and compensation in the way of another right of way you can divest the title of these mortgages?

Col. Winslow. I am not a lawyer, and I do not know.

Mr. Sherley. I am not asking for your opinion, but I am asking whether that question has been considered and passed upon, or whether we may not reach the point where, after the condemnation proceedings, you will still have to acquire the title claimed by the trustees under the mortgages given by this railway company.

Col. Winslow. That I do not know.

Mr. Sherley. When do you expect that these legal tangles will be sufficiently straightened out to enable you to go ahead?

Col. Winslow. We hope by this coming summer. The district officer reports that arrangements have been made for the holding of a special term of the court to consider the condemnation proceedings.

Mr. Sherley. Can any work be done prior to the settlement of this litigation?

Col. Winslow. Some work could be done on the batteries, but not much, for there are other reasons why actual work has not been begun. The condition of the battery plans are not in shape to begin work. The two types of batteries were to have been begun—a 16-inch battery and a 16-inch mortar battery. The designs for the 16-inch batteries were drawn up and were tentatively approved, but they were based upon a system of powder storage which looked to having each charge of powder divided into six cartridges, and we had the magazines most conveniently arranged so that these six cartridges could be stored and handled. The ordnance department made experiments, and as a result the question arose as to whether it would not be advisable to have the entire charge of powder all put up in one cartridge. That charge of powder will be approximately 9 feet long, and this requires quite a different arrangement of magazines and a different method of handling the powder. That question is still under consideration, as the details have not all been definitely decided.

Mr. SHERLEY. When was this determination of the ordnance people as to the advisability of using the powder in one cartridge in place of several arrived at?

Col. WINSLOW. I think that is a question for Gen. Weaver to answer.

Gen. WEAVER. So far as the Coast Artillery is concerned I thought it was settled, because there is no question about the advisability of having a single-section charge.

Mr. SHERLEY. I am trying to get at the question of time.

Gen. WEAVER. It is my understanding that the question of making up the charge in a single section has been settled.

Mr. SHERLEY. The reason for my question is this: That we are here met with the situation that the plans for emplacements had been made in accordance with the law, which requires that to be done before the estimates are submitted, and then subsequently a determination by the ordnance people as to a method of firing the guns which made necessary the entire redrawing of the plans for the emplacements.

Gen. WEAVER. One of our boards in its experiments at Sandy Hook developed data which showed conclusively that we would get more uniform velocities if we had a single charge. This fact developed subsequently to the adoption of the original design for the emplacements. It was decided to be desirable to modify the plans for the new batteries so as to provide for the storage and handling of the single-section charge.

Mr. SHERLEY. Now, Colonel, you say that this matter has not been settled. Do you mean by that that the new designs have not been determined upon or that the desirability of making the change has not been finally settled?

Col. WINSLOW. I mean that the details of the battery, that is, the changes in the details, have not yet been definitely determined.

Mr. SHERLEY. But the desirability of the change itself has been finally determined?

Col. WINSLOW. I understand that has been finally determined. But there are other details connected with it. One is as to the method of getting the powder out of the long cartridge case, as to whether it will have to be shoved out by some form of rammer or whether it can be drawn out. Those questions are still under discussion in the ordnance department.

Mr. SHERLEY. Have you any opinion, or any basis for one, as to when those details will be determined?

Col. WINSLOW. We have drawn up two designs for the magazines and I think one of them will be decided as definitely all right within a comparatively few weeks.

Mr. SHERLEY. You could not anticipate, then, any delay growing out of this instance?

Col. WINSLOW. No, sir. But there is one other instance, one other matter that would have delayed us also. The original designs for these emplacements were based upon each gun having an arc of fire of 170°. The question was raised later as to whether it was not desirable to have some or all of those guns so changed that they could fire all the way around to the rear and be in a position to fire on, if necessary, a land army approaching from the south and west. That question also was carried to the Board of Review and it was in October only that the Board of Review gave its decision in this case. Questions of this kind have delayed the completion of the final construction plans.

Mr. SHERLEY. You say that but little work could be done on the gun batteries. How about the mortar batteries?

Col. WINSLOW. The designs and original estimates for the mortar batteries were made upon the basis of 12-inch mortars. The Board of Review since that time has decided that it is inadvisable to mount any more new 12-inch mortars in our fortifications, that 16-inch mortars must be used instead.

Mr. SHERLEY. That was not new. You told us that last year.

Col. WINSLOW. I know, but the Ordnance Department has not yet completed its plans for the 16-inch mortars to a sufficient extent, in that the engineering department can design emplacements to suit them.

Mr. SHERLEY. Do you know when they will be able to give you those plans?

Col. WINSLOW. I do not know.

Mr. SHERLEY. So at present you are not in a position to do any work?

Col. WINSLOW. Except preliminary work.

Mr. SHERLEY. On the emplacements for the mortar batteries and practically none for the guns?

Col. WINSLOW. Yes, sir; that is the status.

Mr. SHERLEY. Are you in a position now to build your wharf?

Col. WINSLOW. We are in a position now to build the wharf, and the contract for the wharf we expect to be entered into shortly.

Mr. SHERLEY. That is about the only thing you can do there?

Col. WINSLOW. We can do some grading and build the railroad from from the wharf to the battery site.

Mr. SHERLEY. You have a great deal more money than you need at the present time?

Col. WINSLOW. We have more than enough for immediate needs.

Mr. SHERLEY. And more than you will need before the passage of another bill following this bill?

Col. WINSLOW. When we get to work we can expend the money pretty rapidly, but I think we have as much now for Cape Henry as will be required until another bill.

Mr. SHERLEY. In making your estimates this year did you contemplate that any of the money would be spent at Cape Henry?

Col. WINSLOW. The amount included in this estimate for Cape Henry was $828.000.

Mr. SHERLEY. That, of course, you will not need?

Col. WINSLOW. We will not need that this year.

ROCKAWAY BEACH.

(See p. 21.)

Mr. **Sherley**. You have not acquired any land at Rockaway?

Col. **Winslow**. No, sir.

Mr. **Sherley**. The result is, of course, that you have expended no money for emplacement work of any kind?

Col. **Winslow**. We have expended no money at Rockaway except a small amount for surveying the proposed boundaries.

Mr. **Sherley**. There is a law prohibiting you from doing any construction work until the title is vested in the Government in fee simple?

Col. **Winslow**. Yes, sir.

Mr. **Sherley**. You did contemplate, out of the funds given you last year, to build emplacements for seven 12-inch high angle fire guns.

Col. **Winslow**. There is an explanation due on that account, too.

Mr. **Sherley**. What are the facts touching that?

Col. **Winslow**. The facts are these: After the money was appropriated the question was raised by the Chief of Coast Artillery as to whether it was not desirable, in building those batteries, to build them so that they could subsequently be changed into 16-inch batteries. That matter was carried to the board of review and was referred around to the different bureau chiefs. The Chief of Ordnance showed quite conclusively that there would be no economy, as the emplacements proper would be so entirely different. It was only comparatively recently—I think within the last few weeks, I do not remember the exact date now—that it was definitely decided that these batteries should be built as originally designed.

Mr. **Sherley**. When did the Chief of Coast Artillery raise that issue?

Gen. **Weaver**. I did not raise the issue. I think it was raised by the commanding general, Eastern Department, Gen. Wood.

Mr. **Sherley**. When?

Gen. **Weaver**. I think it was raised by the commanding general of the Eastern Department.

Mr. **Sherley**. When, is what I am trying to get at.

Gen. **Weaver**. I think about September.

Mr. **Sherley**. And it took from September until about the 1st of November to come to a decision on it? In the meantime your funds became available—they became available on the 6th of July and you waited until Gen. Wood's criticism was made before any work was started?

Col. **Winslow**. That criticism had been made before—about the time or before the funds became available.

Mr. **Sherley**. They became available the 6th of July.

Col. **Winslow**. That criticism was made about that time and the decision in the case has been within the last few weeks.

Mr. **Sherley**. In other words, it took the War Department from July until three weeks ago to finally determine whether the emplacements for these guns—12-inch guns, high-angle fire—should be so made as to subsequently be available for the 16-inch guns?

Col. **Winslow**. That is the idea; yes, sir.

Mr. **Sherley.** And that notwithstanding the fact that that was very strongly urged upon this committee and upon Congress last year as one of the things most desirable, and most desirable because it could be quickly done—the mounting of these 12-inch guns?

Col. **Winslow.** That is the fact.

Gen. **Weaver.** I would like to make a statement.

Mr. **Sherley.** We shall be glad to hear anything you have to say in this connection.

Gen. **Weaver.** In the first place, I think there was no undue delay in acting on that particular question and, in the second place, I did not have the slightest idea that action on that question would delay any contemplated construction.

Mr. **Sherley.** But let us get at the facts, General. Last year it was stated by Col. Winslow that it would take about a year, as I recall, to build the emplacements for these 12-inch high-angle fire guns, and, presumably, the work was to be started as soon as the money was made available. Now, we made the money available for seven of them on the 6th of July, and to-day, in the middle of December, we are told that just three weeks ago did the matter get in such shape that the engineers could start work.

Gen. **Weaver.** I am only speaking about my connection with the proposition.

Mr. **Sherley.** We are not only concerned about individual connection with it but with the War Department as a whole.

Gen. **Weaver.** I understand.

Mr. **Sherley.** The fact remains that somebody somewhere has sufficiently delayed this matter as to lose practically a year. I suppose you can not do much emplacement work at New York during the winter months?

Col. **Winslow.** We can get ready to do work at Sandy Hook by the time the plans are ready. We have really lost very little time. When the money became available in July there would necessarily have been certain formalities and we could not have begun work until September or October.

Mr. **Sherley.** Does anybody know what the situation is, touching the carriages for those guns?

Col. **Winslow.** My understanding is that they are under contract and that the material has been purchased for them.

Mr. **Sherley.** Do you still believe that you will be able to finish the emplacements in time for the carriages?

Col. **Winslow.** I think we can finish them during the coming season.

Mr. **Sherley.** But you have no personal knowledge now as to whether the carriages will be ready prior to that time?

Col. **Winslow.** No, sir.

Mr. **Sherley.** Do you know, General?

Gen. **Weaver.** I do not.

Mr. **Sherley.** So you have spent none of that money?

Col. **Winslow.** No, sir.

Mr. **Sherley.** How much of the last year's appropriation was it expected to expend for that purpose?

Col. **Winslow.** About $930,000.

EMPLACEMENTS FOR ANTIAIRCRAFT GUNS.

Mr. SHERLEY. It was contemplated out of the funds appropriated last year to build emplacements for some antiaircraft guns; have you been able to do that?

Col. WINSLOW. No, sir.

Mr. SHERLEY. What is the reason for that?

Col. WINSLOW. When the local authorities were asked for detailed suggestions as to the sites for these guns, there was a great deal of objection to emplacing them on fixed mounts, and the question was under discussion for a considerable time as to whether these guns should not be on movable mounts, more like fieldpieces than fixed pieces.

Mr. SHERLEY. Had not that question been determined by the Board of Review when you submitted your estimates?

Gen. BLACK. No, sir; the question had not been determined.

Mr. SHERLEY. Wait a moment, and let us see whether you are not mistaken in that. You came here with a program contemplating a given number of antiaircraft guns. You came here with the estimates for the emplacement of those guns, and if my memory serves me right there was some testimony as to the desirability of having them fixed, and of the fact that you were going to use a higher powered 3-inch gun than was used, for instance, in the Navy, which could probably be used as a movable piece.

Gen. BLACK. Yes, sir; and that has been changed. They are manufacturing two types of antiaircraft guns, one a 3-inch gun and one a 4.2-inch gun. That has come about from the developments in Europe. When the war began aviators were flying at a height of 5,000 feet, but as a result of the work over there, the aviators are now flying at a height of 12,000 feet. It was then thought that in order to give adequate protection, we ought to have a higher powered gun than the one we had at first, and these 4.2-inch guns will give that higher power. There was another question that came up immediately when recommendations were called for from the local officers as to the sites. As you know, our fortification sites are extremely restricted. The observations you made at Fort Morgan, for instance, showed that over a space of 600 yards in front of the batteries and over a space of a couple of miles in the rear, things were demolished, the only safe place being behind the parapets. Therefore, it would be certainly inadvisable to place them on fixed mounts, unprotected, anywhere in the line of the fire at a battery. In order to give you a concrete example, take the case of Fort Delaware, on Pea-Patch Island: there is not a point on that island, except behind the batteries themselves, that these guns would not be directly in the line of fire attacking those batteries. That was one reason why the movable gun was asked for—that is, a gun which could be put under shelter until needed. Since then the Board of Review has gone into the matter further, and we have concluded that it is a perfectly simple matter to make fixed emplacements for these 4.2-inch high-powered guns, and that, as a general rule, these guns will have to be emplaced outside of the limits of our reservations.

Where we have big reservations, like that at Sandy Hook, we will not have to do that, but at Fort Delaware, for instance, and at other small reservations, we do not have any place for them except directly at the batteries. Some two months ago the commanding officers of the departments were directed by the General Staff to submit to them information, as follows: "What valuable enemy targets are there in your department for aircraft, or things which an enemy would want to destroy most? Where are these enemy targets? Name them in the order of importance for the various points and in the order of importance for each point." Instructions were also sent that when those targets were determined upon to fix the positions for the antiaircraft guns, and also that in the determination of these positions they need not be put on the reservations, because those guns can be mounted quite rapidly, if supplied. If we have the material on hand the mount is a very small item and can be put in very quickly. So that for a great majority of the guns that we will install we will have the sites selected, and we will know just how to mount them, but if they are to be placed on private property they will not be mounted at all until war comes, because of the enormous expense involved in the purchase of the land. Those are some of the reasons why the antiaircraft guns have not been installed.

Mr. SHERLEY. What area is it necessary to have for the mounting of antiaircraft guns?

Gen. BLACK. The practice abroad shows that the best results are obtained by mounting them in groups of from two to four. Those four guns are placed at the corners of a rectangular space at a distance of appoximately from 100 to 300 feet apart. In the center of this rectangular space is an observation station. I say observation, but it is not an elaborate house or anything of that kind; but it is simply a telescope mounted on a tripod or some kind of mount that can be readily fixed. The observer is in command of that group, or, rather, the man in command of the group is at the observing station, and then, either by voice or by telephone, he calls to the different antiaircraft guns in that group, telling them what their target is, when they shall begin firing, the angle, elevation, and range.

Mr. SHERLEY. Now, your whole program has been changed as to the antiaircraft guns?

Gen. BLACK. Practically so; yes, sir; on accounty of the experience in the war on the other side.

Mr. SHERLEY. You will do away, then, with the fixed emplacements?

Gen. BLACK. No, sir.

Mr. SHERLEY. In the sense of building them in advance.

Gen. BLACK. Where they have to be placed off the reservation. As to those over on Peapatch Island the intention is, because there is no other protected area that they can get, to put them under the flank of the fortifications or the flank of the parapet in the protected area immediately in the rear of the parapet.

Mr. SHERLEY. Then the situation is this, that the question of whether they shall be on fixed emplacements or simply ready to be mounted in case of the outbreak of war is to be determined by a detailed report as to the physical facts at each of the fortifications?

Gen. BLACK. Yes, sir.

Mr. GILLETT. Do they require a concrete foundation?

Gen. BLACK. No, sir; only a large platform. It need not be indestructible. They can be placed on a table or platform, and that is the most advantageous and convenient method. You can make one of these platforms in one or two days. It does not require extensive and expensive machinery for mounting the guns.

Mr. SHERLEY. Mobile antiaircraft guns are being provided for the Army?

Gen. BLACK. Yes, sir. The other type, the 3-inch gun, would be of the mobile type, which would be with mobile troops and in land-defense areas, for movement to such points as might be necessary. They will have two functions: One—and a very important one—will be the protection of the troops themselves and their field magazines against enemy aircraft, either by driving them off or making them go so high that they can not see. These guns will be movable I think my statements about that are entirely correct.

Gen. WEAVER. Of course defense against aircraft is a new development, and our methods must keep pace with the best practice developed abroad.

Gen. BLACK. And those reports have been coming in.

Mr. SHERLEY. How much of the funds last year were for the emplacements? As I recall it, it was $50,000; and it was contemplated to have enough for 54 anti-aircraft guns.

Gen. BLACK. That will depend entirely on whether you have to build a fixed magazine. Take Peapatch Island, for instance. If you locate anti-aircraft guns at the northern end of that island, they will be in direct line with the enemy's fire at the batteries, and any magazine there has to be carefully built.

Mr. SHERLEY. Why put a magazine out there? Why could not your ammunition be stored in some of the magazines at the battery? Being light ammunition, it could be carried anywhere temporarily and put on the platform for use in the guns in case of actual need.

Gen. BLACK. That is exactly what will be done. But, in any event, you will have this situation that I spoke of. At the same time, when the gun is emplaced, they will make a dugout, such as they are using in the trenches abroad. Of course, it will not be permanent work, because it need not be built in advance, and you do not want to make them of concrete, because that would be very expensive; but if you simply improvise them for use within a year or two, you could use heavy timbers. Of course, those works could not be prepared in advance, because the timber would rot out.

Mr. SHERLEY. Col. Winslow, what other purposes contemplated last year, if any, have you found yourself in a position to spend some money on?

LOS ANGELES BATTERIES.

(See p. 187.)

Col. WINSLOW. A part of the money appropriated last year was for Los Angeles, and that money has been allotted and the work nearly completed.

Mr. SHERLEY. That is the only thing you have been able to do?

Col. WINSLOW. Yes, sir.

Mr. SHERLEY. How much money, then, of this $2,300,000 have you on hand?

Col. **Winslow**. We have $2,125,000 unallotted, but some portion of that, possibly $200,000 of it, will be needed for the completion of the Los Angeles batteries.

Mr. **Sherley**. If I understand you, then, you have spent of that $2,300,000 about $175,000, and it may be necessary to use something like $200,000, or less, to finish the emplacement work at San Pedro. Now you spoke of some contemplated savings there, and I got the impression that that was due to a lessening of the unit cost. Has there been any saving by virtue of the elimination of anything that you expected to do there?

Col. **Winslow**. A part of the saving is due to the introduction of a cheaper concrete plant, distributing the concrete by chutes from a high tower, and another part of the saving at Los Angeles has been due to the fact that the tunnel estimated for last year has not been built. At the time the estimate was submitted, it was considered that the tunnel was needed for two purposes:

One, to give communication between the batteries in the rear of the hill and the batteries in front of the hill, and communication for the men, and also a protected route for the cables and telephone lines. The second was that it seemed at that time the only way to dispose of the sewage of the post (the post was then planned to be built on the rear slope of the hill) was to take it through this tunnel, and then out to the ocean in front. Subsequent to the submission of the estimate for the tunnel, it was decided that the post will not be built on the upper reservation, but upon a lower reservation on the shores of the harbor, something less than a mile away. By the elimination of the barracks and quarters, and the other large buildings, the amount of sewage will be reduced very much, and the amount that will remain is considered to be so small that it may be turned into the sewers of that part of the city. So the need of the tunnel is not now considered pressing, since its use for sewage disposal is no longer required.

Mr. **Sherley**. So you have given up the view that was so strongly urged here about the protection of the men from the sky line and from being shot at.

Col. **Winslow**. It was decided, after the need for the tunnel, so far as sewage disposal is concerned was taken away, that the additional advantages were not sufficient to justify its cost.

Mr. **Sherley**. You are practically, then, so far as the work itself is concerned, where you were last year, except for the work at San Pedro and San Diego?

Col. **Winslow**. So far as the actual work is concerned; yes, sir.

Mr. **Sherley**. You have estimated in here for $3,675,000. Now, what do you contemplate doing with it?

CAPE HENRY, VA.

(See pp. 9, 66, 114, 187.)

Col. **Winslow**. The basis of that is as follows: For completing the work at Cape Henry, $828,000, in addition to the money supposed to be taken out of last year's appropriation.

Mr. **Sherley**. You have $828,000 available there now. You testified awhile ago that you had $828,000, or it may be that you misunderstood my question. You were talking about this year's estimate?

Col. **Winslow**. Yes, sir.

Mr. **Sherley.** I was asking you how much of the amount that was appropriated for Cape Henry last year was available and unexpended, and you gave me that figure of $828,000.

Col. **Winslow.** No, sir. The amount appropriated in July, which we have not yet expended this year, we certainly expect to expend next year.

Mr. **Sherley.** How much is that?

Col. **Winslow.** $1,144,000.

Mr. **Sherley.** Now, having that much on hand, do you want $828,000 additional for Cape Henry?

Col. **Winslow.** We think that $1,144,000 will do for Cape Henry for the next fiscal year.

Mr. **Sherley.** Will this loss of time delay you to a point where you will be behind the ordnance people?

Col. **Winslow.** I think not, because a certain amount of that money was intended for 16-inch mortars, the plans for which, so far as we know, are not absolutely completed; and, as for the 16-inch guns, they are going to be very slowly delivered.

Mr. **Sherley.** The result will be that while you will be up to them, it will be because they will be slower than was originally contemplated?

Col. **Winslow.** Yes, sir.

Mr. **Sherley.** We will be a year or more longer, then, than we figured in getting Cape Henry fortified?

Col. **Winslow.** Yes, sir.

Mr. **Sherley.** Now, what is the other item that goes to make up that amount?

EMPLACEMENTS FOR 12-INCH LONG-RANGE GUNS.

Col. **Winslow.** $2,322,000 for eighteen 12-inch long-range guns.

Mr. **Sherley.** The emplacements for them?

Col. **Winslow.** Yes, sir; the emplacements for them.

Mr. **Sherley.** Where are they to be?

Col. **Winslow.** At Portland, Boston, Fort Hancock, Fort Delaware, Pensacola, Galveston, and New Bedford.

Mr. **Sherley.** Last year we appropriated for seven.

Col. **Winslow.** Yes, sir.

Mr. **Sherley.** You have already explained why none of that money was spent.

Col. **Winslow.** Yes, sir; but that money will go rapidly when we start.

Mr. **Sherley.** How many of these guns were there in the scheme? There were 27, were there not?

Maj. **Emrick.** Twenty-four in the United States.

Mr. **Sherley.** So this completes the program for the United States?

Maj. **Emrick.** Yes, sir.

Mr. **Sherley.** These being scattered at different places, the work can be carried on simultaneously?

Col. **Winslow.** Yes, sir.

Mr. **Sherley.** Notwithstanding the fact that you have $730,000 that you did not expend for the seven emplacements contemplated in last year's appropriation, you think that you need his $2,322,000 for these 18 emplacements?

Col. **Winslow.** Yes, sir.

Mr. **Sherley.** You will carry on the work on the 24 emplacements imultaneously?

Col. **Winslow.** Yes, sir.

Mr. **Sherley.** Now, do you think that you will be able to do this within a year, or next year?

Col. **Winslow.** I think we will go on with all of this during the oming summer.

Mr. **Sherley.** There are no more questions about the matter?

Col. **Winslow.** So far as I know, there are no more questions. The type plans for these emplacements were sent up to the Board of Review for approval. I was just talking to Maj. Emrick, the recorder of that board, and he said that these plans were approved t the meeting this week.

Mr. **Sherley.** Then it is determined, once and for all, to build these emplacements for 12-inch guns, without regard for their use ubsequently for 16-inch guns?

Col. **Winslow.** That is my understanding.

Mr. **Sherley.** I think the committee would like to know that this s behind them. We do not want to hear next year that some new uestion touching these guns has arisen.

Gen. **Weaver.** The committee does not wish us to ignore new conditions that may arise?

Mr. **Sherley.** By no means; but we would like for you gentlemen o span the future with a filmy bridge of thought, at least.

Gen. **Weaver.** We will look into the future as far as we can.

ROCKAWAY BEACH.

(See p. 14.)

Col. **Winslow.** The remainder of the estimate, consisting of $525,000, is for inaugurating the work at Rockaway Beach. That s only about one-fourth of the estimated cost of the batteries at hat point, but that particular figure was used so as to make the otal submitted $3,675,000, in accordance with the Board of Review's program.

Mr. **Sherley.** Now I anticipate what you are going to say. In ew of the fact that the $828,000 asked for Cape Henry is not eded, is it your desire that that amount be still given and added o the $525,000 at Rockaway Beach, in order to more rapidly carry n the construction work there?

Col. **Winslow.** That is exactly the point I was coming to; also e other point; that is, we know that the Ordnance Department will ave their plans for the turret to go at Fort Michie at the entrance to ong Island Sound sufficiently far advanced for us to begin, next mmer probably, on the foundation for that turret, and we may sire to include this work, although we have not now the detail awings to make an official estimate of the cost of this foundation, required by law.

Mr. **Sherley.** You would want an informal understanding ereby such of these funds as might be available could be used for foundation work for the turret at the eastern entrance to Long and Sound?

Col. **Winslow.** Yes.

Mr. Sherley. You contemplate that the acquisition of the site at Rockaway Beach will be actually an accomplished fact sufficiently early to enable you to begin your work there?

Col. Winslow. We do.

Mr. Sherley. And the moneys available which you can expend in the next 15 months amount to approximately $1,300,000?

Gen. Black. Our procedure will be to first fill the sites for our batteries. This is sand and settles rapidly, so that the minute the sand is deposited from the hydraulic dredge you can go to work on it and begin construction work.

Mr. Sherley. Will you have to make a pile foundation there?

Gen. Black. I do not think that is contemplated. It is sand all the way down.

Mr. Sherley. I said a moment ago $1,300,000 for Rockaway. I believe, however, that the should be qualified. It was contemplated that some of that sum would be spent on the foundations at the eastern entrance to Long Island Sound.

Gen. Black. At Fort Michie.

Mr. Sherley. How much?

Col. Winslow. We can not state definitely how much those foundations will cost, because, as I say, we have not made the drawings, but we think we can profitably expend one-quarter of a million dollars.

Mr. Sherley. That would leave something over $1,000,000 fo Rockaway Beach.

Col. Winslow. Yes, sir.

Mr. Sherley. And that amount you believe you can use?

Col. Winslow. Yes, sir.

Mr. Sherley. So you do not desire to decrease your submitted estimate because of the funds that are now in your hands unexpended for Cape Henry?

Col. Winslow. That is the idea.

Gen. Black. We would like to complete the entire project contemplated by the board of review within the time fixed by the board of review.

Mr. Sherley. I understand that; but at the same time there is n need of appropriating moneys to be in the Treasury unless they ca be expended.

Colonel, is there anything else you want to say touching this estimate for construction of gun and mortar batteries?

Col. Winslow. I know of nothing else.

Mr. Sherley. You have increased the amount that you thin necessary for this work due to the increased cost of material?

Col. Winslow. As far as we can tell.

Mr. Sherley. To what extent have you made an increase?

Col. Winslow. Principally in the long-range 12-inch guns' emplacements. Those estimates have run up from about $105,000 p gun to about $130,000 or about $135,000.

Mr. Sherley. That is due to the increased cost of labor as we as material?

Col. Winslow. Yes, sir; labor and material.

Mr. Sherley. The material consists largely of concrete and san

Col. Winslow. Concrete and sand.

Mr. Sherley. Has there been any pronounced increase in t price?

Col. **Winslow.** There has probably been some, but we do not know positively how much. These estimates have come from the local officers.

Mr. **Sherley.** Your labor cost has increased, of course?

Col. **Winslow.** Undoubtedly. It has increased in some places fully 30 per cent.

MODERNIZING OLDER EMPLACEMENTS.

Mr. **Sherley.** The next item is for modernizing older emplacements. Last year you asked $78,500 and we appropriated that sum. What is the situation touching your funds?

Col. **Winslow.** All of that has been allotted except $24,000.

Mr. **Sherley.** What did you do with it?

Col. **Winslow.** We entered into a contract for 50 back-delivery and 3 front-delivery 12-inch Taylor-Raymond hoists, and we allotted $20,000 for the motor equipment for these hoists.

Mr. **Sherley.** As I recall it, that sum was for the purpose of getting hoists to handle the new long-point projectiles?

Col. **Winslow.** That is correct.

Mr. **Sherley.** At what places?

Col. **Winslow.** Allotments have been made to Portland, Boston, Newport, New London, New York, Philadelphia, Norfolk, Charleston, Key West, Tampa, Mobile, New Orleans, Galveston, San Francisco, Portland, and Seattle; practically everywhere.

Mr. **Sherley.** They are all 12-inch hoists?

Col. **Winslow.** Twelve-inch hoists; yes, sir.

Mr. **Sherley.** You no longer contemplate new hoists for the 10-inch?

Col. **Winslow.** Yes; we contemplate widening the 10-inch hoists where they are in a primary battery. Then in addition to the allotments which were made for the hoists, $8,200 has been allotted to a number of places for the purpose of introducing new firing circuits and new fire mechanism for mortar batteries, and $5,300 for modernizing the mortar batteries at Charleston, so as to make the ammunition service more rapid.

Mr. **Sherley.** Was the expenditure for modernizing the firing circuits of mortar batteries contemplated last year?

Col. **Winslow.** It was, in fact, contemplated before last year, but has not been done until this year; that is, after a number of experiments had been made at Fort Monroe to determine the most convenient places to locate the firing magneto for the mortar batteries and the most convenient method of leading the firing wires into the mortar pits.

Mr. **Sherley.** Your balance has been allotted, but not expended?

Col. **Winslow.** There is actually $97,000 in the hands of disbursing officers, but a very large part of that is covered by the contract which has been entered into for building hoists.

Mr. **Sherley.** What free balance, if any, have you?

Col. **Winslow.** $24,000. That is for doing the cutting work at the various emplacements where these hoists just contracted for are to go. The district officers have been sent drawings and have been directed to submit detailed estimates for the doing of the particular cutting.

Mr. **Sherley.** You are now asking $102,000?

Col. WINSLOW. That is, to complete the widening of hoists. It covers all of the 10-inch hoists not yet widened and a few of the 12-inch not yet covered by appropriations.

Mr. SHERLEY. If that sum is allowed, is it going to complete the work?

Col. WINSLOW. We hope it will complete the widening of the hoists, as it is not now proposed to widen either 8-inch or 6-inch hoists. These come under the head of modernizing; also some other general work, a number of different items, of which I have a long list here, most of the items are small.

Mr. SHERLEY. When this work is done is there any other work of major importance left in connection with modernizing?

Col. WINSLOW. During the hearing of last year it was mentioned that it was thought it would be desirable in the near future to add to the protection of magazines at a number of our older batteries, but the experiments at Fort Morgan have shown us that the danger at least is not very great; that naval artillery will have to be much increased in its ability to penetrate sand before it will be necessary for us, except in a very few cases, to increase the protection of our older batteries.

Mr. SHERLEY. As a result of those experiments have there been any marked modifications in the character of emplacements contemplated to be built?

Col. WINSLOW. The type plan for our large emplacements, upon which our estimates were submitted, have been modified: there is a decrease in the amount of concrete and an increase in the amount of sand, the net result being a decrease in cost. That is the reason these estimates have not gone up in the same proportion with the other estimates, due to the increased cost of labor and materials.

Mr. SHERLEY. You are using, with the modification suggested, the type of emplacements put in at Panama, subject to this lessening of concrete and this increasing of sand protection?

Col. WINSLOW. Yes, sir.

Mr. SHERLEY. Gen. Black, from time to time there have been citicisms as to what was charged to be an unnecessary elaborateness in the emplacements that we build in connection with our seacoast fortifications. I understand that a study has been made looking to the ascertainment of the proportion of cost that the emplacement bears to its maintenance during its probable life.

Gen. BLACK. Yes, sir.

Mr. SHERLEY. I would be glad if you would make a statement as to the conclusions that were arrived at as the result of that study.

Gen. BLACK. A battery, looking at it from an economic standpoint, is quite comparable to a manufacturing establishment where a certain sum is invested in buildings, another certain sum in machinery, and the remaining cost comes in the payment of the personnel. If by increasing the investment in machinery the number of operators required is lessened it is generally found economical to make it. The principal charge for running a battery, just as the principal charge in almost all manufacturing concerns, is in the pay of the personnel employed. Taking the total amount of fixed investment in the battery and taking the actual interest on that cost and capitalizing the cost of the employees, if it be found that a slight increase in the fixed investment for the battery makes a marked decrease in the cost of employees, then those improvements which lead to that increase in the cost of the battery are fully warranted. Again, if a slight increase in the fixed cost of the battery leads to a greater efficiency of shooting, to a greater probability of hitting, and a decrease of the probability of losing your armament or demoralizing your men by losses, that will be warranted. The whole subject must be investigated from the standpoint of efficiency, considering all the elements. Those of the elements which form the greatest proportion of the fixed annual charges should be reduced, if possible, by the substitution of some other element or the increase of some other element which forms a smaller proportion of the annual cost.

Mr. **Sherley.** Is it a fact that the cost of personnel necessary to man a modern battery is the large cost?

Gen. **Black.** The figures obtained would show that such is the case.

Mr. **Sherley.** In other words, it is believed, assuming the life of a modern battery to be some series of years, say, 20 or more, that the cost of the personnel necessary to man that battery over that period of time constitutes the largest element of cost in connection with the battery as a whole?

Gen. **Black.** It is so believed; yes.

Mr. **Sherley.** And that any reasonable increase of cost in emplacements or other accessories of the battery that reduces the number of men necessary is more than justifiable from an economic standpoint?

Gen. **Black.** Within limits, that is the case; yes, sir.

Mr. **Sherley.** Some detailed study was made to arrive at that conclusion?

Gen. **Black.** Yes, sir; those figures were all worked out with a great deal of care.

Mr. **Sherley.** Perhaps you can illustrate with some concrete example, General?

Gen. **Black.** In the older forms of batteries all of the ammunition had to be lifted for the service of the guns from a lower level to a higher level. In the modern form of battery that lifting is unnecessary, and the ammunition is stored on the same level as the gun platform. That reduces, then, the amount of personnel required slightly in first number and pretty markedly in the number of reserves, because the fatigue attendant on the service of the gun is lessened thereby, and a man's labor is better utilized.

Mr. **Sherley.** There is also an increase in the rapidity of firing, is there not?

Gen. **Black.** Yes, sir.

Gen. **Weaver.** It also reduces the hoisting equipment?

Gen. **Black.** Oh, yes; it reduces the hoisting equipment.

Mr. **Sherley.** So that even though there might be an added cost in the first instance, the fact that by virtue of this change, whereby the ammunition is stored on the same level with the gun, the added cost would be more than justified in the long run by the lessened number of personnel necessary to man that particular battery?

Gen. **Black.** Yes, sir. Another item which I could mention is this: When sea-coast defenses are threatened by an enemy the time of actual fighting is fixed by the enemy; he chooses the time when to appear and when to disappear, getting within range or getting beyond range. This requires that during all the time an enemy's fleet is close at hand the gun crew must remain at the battery day and night, and unless they can be cared for there so as to be measurably comfortable their own efficiency decreases very materially and they are unable to do their duties properly when called upon. This is especially the case where the men are exposed to the weather, where they have no opportunity to have cots on which to sleep, and where they have to go quite a distance for their meals. A certain number of men must be present all the time, and the further they have to go the greater the number of men needed as a reserve to take the places of the men necessarily absent or to replace the men at the guns when they become exhausted. I marked this fact personally during the maneuvers. Some of our older batteries have very large covered corridors and some have not. I have found that where these covered corridors are in existence, giving shelter from the weather, and where the men had their cots where they are not in the way at all during action, the men are in comparative comfort, can live there and stand the strain for a long time, and that where they have no such protection at all, and where they have to be out in the open they become much more fatigued and much less efficient. I think Gen. Weaver will bear me out in all of those statements.

Gen. **Weaver.** Yes.

Mr. **Sherley.** Suppose, General, you have the statement you referred to inserted in the record.

* * * * * * *

2. *Simplification of emplacements.*—In several places in the report itself as well as in the indorsements thereon the existing defenses at Panama are criticized for what is considered their unnecessary elaborateness and cost; furthermore, it is recommended in these papers that in future construction very much more simplified forms of mounts and emplacements be used, so as to reduce the average cost of mounting and emplacing a gun and thus permit a greater number of guns to be mounted for the same amount of money.

3. The costs of the gun carriage and of the emplacement are but two factors in the total cost connected with any gun, and by no means the largest factors.

4. For every gun that is emplaced there must be the personnel to man it, consisting of officers, noncommissioned officers, and privates, all of whom must be paid, rationed, and maintained. For the maintenance of this personnel Army posts are necessary, the sites of which must generally be purchased. Barracks, quarters, storehouses, hospitals, etc., must be built and water supply, sewerage, lighting, and other incidentals of post life must be installed. The cost of all these items relating to the pay, subsistence, and maintenance of this gun crew are just as much charges connected with the gun as are the costs of the carriage and of the emplacement.

5. Some of these costs, such as the purchase of sites, the manufacture of the gun and carriage, the construction of the emplacements and barracks, quarters, storehouses, hospitals, and other buildings, and, to some extent, the installation of water supply and sewerage, are expenses which are made once for all. Other expenses, such as pay, salaries, subsistence, heat, fuel, light, water, etc., are continuing expenses and go on from day to day and from year to year. In attempting to make a summation which will include items of first cost as well as items of continuing cost, we must reduce the two to a common basis either by capitalizing the running expenses or by converting first cost into running expenses by considering the probable serviceable life of the utility and the interest on the original investment.

6. Taking the second method, we have for each private has pay, varying with the length of service, his subsistence, his clothing allowance, his pro rata share of the first cost and upkeep of the barracks, quarters, hospitals, roads, sewers, etc. The total mounts rapidly and results, even in the case of a private, more than $600 per annum. In fact, in similar calculations made by various persons during the debates in Congress on the Army reorganization bill, it w

figured that the cost of similar items for the Infantry was not much less than $1,000 per year per man. From this $600 or so, as figured above for a private, the annual cost per man mounts rapidly through the various grades of noncommissioned officers and officers until a total of some 10 times this figures is reached in the case of the field officers.

7. The emplacements at Panama which have been most criticized are those pertaining to 14-inch guns. The personnel pertaining to such a gun is something like 70 officers and enlisted men, the total cost of whose pay, manitenance, and other similar items amounts to fully $70,000 per annum.

8. The cost of the disappearing carriage for a 14-inch gun is about $68,000, and of the emplacement about $170,000. Assuming 25 years as the utility life of the carriage and emplacement, and figuring interest on the original cost at 3 per cent, we get at what may be called the running annual cost of the emplacement as 7 per cent of the first cost, or about $12,000 per year, about equivalent to the upkeep of 20 privates. The similar figures as to the gun carriage is less than $5,000, or about equivalent to the upkeep of eight privates.

9. There are other items of annual cost into which it is not necessary to go into detail here, such as the item relating to the gun itself, that related to the power plant, the preservation and repair cost, etc., amounting in all to something over $100,000 per 14-inch gun per annum. Of these items of annual cost, that relating to the personnel is by far the largest, amounting to about two-thirds of the whole, while the sum of the items relating to the carriage and emplacement amount to only about one-sixth of the whole or one-fourth of the personnel cost. Consequently, an increase or decrease of a given percentage in the carriage and emplacement item will have only one-fourth the influence on the whole annual cost as a charge of the same percentage in the personnel cost.

10. In the combined items of the carriage and emplacement there are many elements: There is the gun carriage, the gun block, the loading platform, the parapet, the magazine, and shell rooms, and the appliances for ammunition service, the plotting room, the fire-control apparatus, the power plant, and electric system, and the other incidentals, such as that connected with the comfort of the personnel.

11. The cost of a carriage for a particular gun depends upon its type, whether it be disappearing or barbette; whether it be all-around fire or limited fire. It is understood that, in the case of large guns, the difference between the cost of carriages of different types does not usually exceed 10 per cent of the cost of the carriage. Since the carriage item itself is less than 4 per cent of the total annual cost, a change of 10 per cent in this item is a change of less than one-half of 1 per cent of the whole, and it is seen that any modification in the carriage which can decrease by even a single man the size of the detachment necessary for the service of the gun must more than pay for itself.

12. The parapet is for the protection of the gun and of the detachment and incidentally for the psychological purpose of giving the individual of the gun detachment a sense of security in time of action. Whether or not a parapet is needed, that is, whether the gun should disappear behind the parapet or should be mounted in the open, is a much discussed question, but the experiments at Fort Morgan last spring showed most clearly that the parapet in front of a disappearing gun forms a real protection both to the gun and the personnel, and that a fair proportion of the projectile which, in the absence of the parapet would probably have detonated in the immediate vicinity of the gun emplacement and have thus done serious damage to the gun and the personnel, were caught by the parapet and were either deflected away or were detonated under conditions as to do practically no damage to the gun or its detachment.

13. Calculations show that the cost of the parapet is usually less than 15 per cent of that of the emplacement. The cost of the emplacement is less than 12 per cent of the entire annual cost, and consequently, the item of annual cost due to the parapet falls below 2 per cent of the entire annual cost. Consequently, if the parapet gives sufficient protection to enable a gun to fire 2 per cent more shots at the enemy before being knocked out, than it would if the parapet were not there, it would appear that, even neglecting the protection given to the men, the parapet has fully paid for itself. That it will do many times this is shown clearly by the Fort Morgan experiments. In addition, there is the protection offered by the parapet to the personnel. Where there is such protection, the number of additional men which it is necessary to keep at hand to provide for casualties in time of action should be much less than were there no parapet. The portion of the annual cost pertaining to the parapet is equiva-

lent to no more than the annual cost of three privates. If, therefore, the parapet will permit the number of reserves available to replace casualties to be reduced by them it will have paid for itself in a reduction in the personnel item without considering its protection to the gun and carriage.

14. The magazine and shell room must have sufficient protection to prevent their destruction by hostile projectiles, for the results of a magazine explosion will probably be so disastrous in the destruction of life and property and in the demoralization of the garrison that such an occurrence must be prevented if possible.

15. The magazine may be placed close to the guns with floors on the same level as the loading platforms, thus providing quick and rapid horizontal ammunition service; or, it may be placed at a distance, or perhaps at a lower level. If placed close to the gun the magazine will, at least in the case of a direct-fire gun, usually be visible and will be much more subject to hits. If placed farther away, or below the level of the gun, it will be less subject to being struck and the cost of its protection will probably be less. But if placed at a level below the gun, appliances for raising ammunition up to the level of the gun must be installed. These cost something, but the greatest expense connected with them is the additional number of men required for the ammunition service. If the magazine be removed to a distance from the gun in order to reduce the cost of protection, an increase is necessary in the size of the detachment and therefore in the personnel item of cost, and it takes but a slight increase in this item to more than overbalance the reduced cost of magazine protection. This matter was gone into thoroughly at the time the Panama Canal fortifications were designed and an analysis showed clearly that to have the magazines fairly close to the gun and with their floors on the same level with the loading platform of the gun an ease and rapidity of ammunition service was attained in the decrease in the number of men necessary, which more than compensated for any increase in the cost of protection necessary.

16. In most of the 14-inch emplacements at Panama rooms have been built for the comfort and necessities of the officers and the men. In time of war, when a hostile fleet is known to be anywhere in the vicinity, the officers and men must remain habitually in the immediate vicinity of the gun, and everything that adds to their comfort and mental composure at such a time, or decreases the time taken for necessary absences, increases their efficiency in actual time of action. Consequently, it is believed that it pays to build for each emplacement a room for the officers, with a convenient toilet near; this room being made large enough so they can have their bunks and their desks and can attend conveniently and regularly to the business connected with the battery, and to install latrines for the enlisted men conveniently situated to the magazine and loading platforms.

17. It should be noted, also, that these arrangements for the comfort of the personnel in the Panama battery are usually located in retaining walls which had to be built in any case, or in long corridors necessary for communication, and the additional expense due to installing such arrangement was an extremely small proportion of the entire cost of the emplacement. The sites of a number of the Panama batteries, including those on the Pacific end, are on islands the total area of which is so small that there were no convenient locations available for locating the toilet arrangement, outside of the emplacements themselves.

18. On Flamenco, the most advanced of the Pacific Islands, dormitories for men were built in a parados across the gorge, taking the place of retaining walls that would have been necessary in any case. This island is but a mountain top rising out of the ocean. It is extremely steep and the camping of the men on its slopes is out of the question. When the time comes for men to live in the vicinity of the batteries they can not be bunked in the magazines or corridors, or on the loading platforms, for their bunks would be in the way in case of a sudden call. The provision of the rooms where, if necessary, double-deck bunks can be installed, takes care of the men in about the smallest amount of space possible. It makes it possible to allow a larger proportion of the men at the battery to get their regular sleep, and therefore tends to keep the garrison in good physical condition. It undoubtedly reduces the number of men necessary for the service of the batteries in this island, for if the men at the battery were unable to sleep and had to go considerable distance to take their rest, more reliefs must be provided.

19. It is mentioned in one part of the report of the board of officers that such arrangements as have just been mentioned for the comfort and con-

venience of the garrison are unnecessary and a useless expense, because they may never be called into use. The same argument would apply to the guns and emplacement themselves. But to go to the expense of building guns and carriages, of constructing magazines and other absolutely essential details, of enlisting and training the personnel, of building posts, barracks, quarters, and other incidentals for their care, and then to attempt to save in first cost, by omitting to provide any details which will in the end reduce the largest item of continuing cost, the item of personnel, or which will aid in the slightest in the efficiency of the battery, the accuracy and rapidity of fire in time of action, in the ease of ammunition service, or in those comforts which will tend to keep the garrison in better condition, would appear to be exactly the reverse of economical.

20. To the casual observer gazing down a ravine, it would appear that it will cost almost nothing to emplace mortars in the ravine, but it should be noted that in a country of heavy rainfall, such as Panama, the side of the ravines are usually steep and the slope of the bed of the ravine is also apt to be steep. Level alluvial flats are extremely rare and are usually not found in the ravines themselves.

21. In order that it may be served, a mortar requires around it a level platform of considerable area. In order that easy horizontal ammunition service may be provided, an additional area on the same level as the mortar platform must be provided for the storage of the ammunition. Therefore, wherever ravines are taken as the site of mortar batteries considerable excavation and leveling is essential and high retaining walls are necessary to hold up the sides of the excavation. The amount of such work actually found to be necessary when the drawings are made is many times greater than the casual observer can imagine. In practice the mere open platform type of emplacement with magazines tunnneled into the sides of the ravines becomes essentially the type of mortars built on the canal, at Toro Point, and on the rear of Flamenco island.

22. In two out of three mortar batteries built on the Canal Zone (and in third battery such was not possible) advantage has been taken of the neighboring hills for protection of the mortar battery, and, in consequence, no artificial protection has been given on the front or on the flanks of such batteries other than the walls necessary to keep the earth from falling into the magazine, and the only overhead protection provided is the concrete necessary to hold up the slope of the side of the hill. It is difficult to see how these elements could be simplified.

23. As in the case of 14-inch batteries, computation shows that the personnel item of annual cost in the case of mortar batteries is many times greater than the emplacement item, and any attempt to decrease emplacement cost, by locating magazines inconveniently to, or on different levels from, the loading platforms means, necessarily, an increase in the size of the detachments, with a resulting increase in what is already the largest item of annual cost.

24. Prior to the passage of the act of June 3, 1916, when the normal organization of the Coast Artillery Corps was in companies, requiring the detail of an integral number of companies to a battery, so that if one company was a few men short of the necessary quota for any battery it was necessary to detail a whole additional company to that battery, the proper regulation of the size of the battery personnel was somewhat difficult to arrange. The new organization of the entire Coast Artillery into one corps permits the assignment to any particular battery of exactly the number of men needed to serve the guns, care for them, and to provide a fair reserve to replace casualties in time of war.

25. The Panama batteries were designed with the purpose of requiring the minimum number of men for their service and it is believed that more careful consideration will show that the saving in the decrease of personnel necessary for these batteries offsets by several times their increased emplacement cost.

26. The importance of the personnel item in the annual cost of a gun has apparently never received the consideration which it merits, and, in fact, has been largely overlooked by many persons in the service. In the true economy seacoast defense the questions of emplacements and personnel cost are closely analogous to the plant and personnel cost in commercial manufactories, where an owner frequently finds it economical to scrap a $5,000 plant, although performing good work, and replaces it by a $10,000 plant, if the more expensive plant will permit him to make any material saving in his pay roll. In the ultimate question of seacoast economy it is not a question of whether

with a given sum of money 10 heavy guns with simplified surroundings can be emplaced where no more than 9 could be emplaced with the usual type of emplacement, or even if 3 could be mounted in place of 2, but rather, whether by carefully planning our emplacements and increasing the convenience of the ammunition service and the protection for the personnel, we can not make it possible for 70 men to do what would require 80 men in emplacements of the simplified type.

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Mr. SHERLEY. Colonel, what method of modernizing is in contemplation other than that estimated for here?

Col. WINSLOW. A number of items have been collected which may be considered eventually, and the estimate runs up to about $400,000. They are not considered urgently necessary now, and it is very possible that changes in conditions may throw out a great many of these items just as changed conditions threw out some last year. At some places where paradoses are now considered necessary it may be that changed conditions will show that they are unnecessary. A few of the older batteries need increased fields of fire, but it may be that they will be susperseded by more modern batteries and, therefore, it may be unnecessary to increase the fields of fire of the older batteries. However, this amount of money now estimated practically completes our present program of modernizing, but, of course, we can not tell what may take place in the future.

CONSTRUCTION OF FIRE-CONTROL STATIONS AND ACCESSORIES IN UNITED STATES.

Mr. SHERLEY. The next item is found on page 9, for the construction of fire-control stations and accessories, including purchase of lands and rights of way, etc. Last year you asked for $617,982.80, and Congress appropriated $600,000.

Col. WINSLOW. Only a small part of the fire-control item pertains to the Engineer Department. This item pertains to the office of the Chief of Coast Artillery, although a certain proportion of the appropriation is allotted to the engineers for construction work.

Mr. SHERLEY. You do not keep the books on that?

Col. WINSLOW. No, sir.

Mr. SHERLEY. Gen. Weaver, suppose you state what was done with the $600,000 appropriated for this purpose last year. Last year you testified that of the sum that was asked $294,900 was for observing instruments for batteries not then so equipped, and that it was for azimuth instruments, depression-position finders, short, horizontal base-range finders, etc.

Gen. WEAVER. That sum was for 198 azimuth instruments, 21 depression position finders, and 76 short horizontal base instruments, and the amount of the estimate, $294,900, has been allotted to the Ordnance Department for the purchase of these instruments.

Mr. SHERLEY. In addition to that, the estimate included for the San Pedro installation the amount of $156,600.90, and for the San Diego installation the amount of $166,481.90, making a total of $617,982.80, which was the amount of the estimate submitted. Now, can you divide that between the different departments, and state what was done with the total sum?

Gen. WEAVER. I have already given the allotment and the object of expenditure of $294,900. Of the $156,600.90 estimated and appropriated for San Pedro, there was $49,935 allotted to the Ordnance Department and $46,939 to the Signal Department, for the respective work of those departments; and for the San Diego installation there was allotted $42,170 to the Ordnance Department and $42,311.90 to the Signal Corps.

Mr. **Sherley.** Do you know what has been expended, or the balances in these various departments?

Gen. **Weaver.** I can not give you those balances now.

Mr. **Sherley.** Suppose you make a note of that and put it in the record.

Gen. **Weaver.** I will do that.

Treasury balances and unobligated balances in the hands of construction departments.

	Treasury balance.	Unobligated balance.
Ordnance Department	$492,327.58	$9,091.62
Engineer Department	85,166.57	666.57
Signal Corps	58,809.94	....

Mr. **Sherley.** First, did you expend the $294,900 for those observing instruments?

Gen. **Weaver.** All of that has been allotted to the Ordnance Department and is now obligated to meet contracts entered into or orders placed at arsenals for these instruments.

SAN PEDRO, CAL.

(See pp. 7, 100, 155.)

Mr. **Sherley.** Referring to the installation at San Pedro, that was to complete the installation of fire control?

Gen. **Weaver.** Yes, sir; at that point.

Mr. **Sherley.** For everything except that 3-inch battery—it did not include that.

Gen. **Weaver.** No, sir.

Mr. **Sherley.** Do you know what the condition of the installation is?

Gen. **Weaver.** None of that has been expended; it is simply awaiting the completion of the batteries.

Mr. **Sherley.** Some of it is expended along with the completion of the batteries, is it not?

Col. **Winslow.** No, sir; not fire-control funds. All such work, in the battery proper, is considered as essential to the battery and as part of the battery cost. Then there is the battery commander's station, as it is called, which is usually built in the rear part of a battery. This is where the battery commander is to stand. It is considered a part of the battery construction, and its cost is charged not to fire control but to battery construction.

Mr. **Sherley.** In building the emplacements you make provision for the conduits that carry the wires for the fire control?

Col. WINSLOW. All of that work in the battery is considered a part of the battery construction, and it is charged to that appropriation.

Mr. SHERLEY. Nothing has been done toward the actual installation of the fire control at San Pedro?

Col. WINSLOW. No, sir.

Mr. SHERLEY. Why not?

Gen. WEAVER. The final plans are not yet completed.

Col. WINSLOW. There is a board in existence at the present time to decide upon some of the details of the location of those stations.

Mr. SHERLEY. What was the need of getting that money last year?

Gen. WEAVER. We thought that we would be ready by this time.

Mr. SHERLEY. Was that also true at San Diego?

Gen. WEAVER. No, sir. Plans for a part of the installation have been approved, but I can not say whether work has been undertaken or not. A part of the installation is for those two new mortar batteries——

Col. WINSLOW (interposing). The work in the immediate vicinity of the mortar batteries is completed.

Mr. SHERLEY. How soon do you expect to have this fire control installed?

Gen. WEAVER. In the course of the coming summer.

Mr. SHERLEY. Last year you asked $617,982.80, and we gave you $600,000. Will that be enough?

Gen. WEAVER. We are asking this year for the additional $17,982.80 to make up that difference.

Mr. SHERLEY. Of course, if you have not expended any of it, you do not know.

Gen. WEAVER. I can give you an analysis of the estimate for 1918.

Mr. SHERLEY. Before we go into that—last year we cut your estimate pretty nearly $18,000?

Gen. WEAVER. Yes, sir; and we still need that.

Mr. SHERLEY. How do you know that you do?

Gen. WEAVER. On the basis of the original estimate that amount is still needed. We are unable to say now that the work contemplated under the 1917 estimate can be carried out for less than that estimate.

Mr. SHERLEY. Suppose you give me a statement of what makes up your estimate of $608,796.21.

DETAILS OF ESTIMATE.

Gen. WEAVER. The total estimate for the engineer department is made up of the following items: For horizontal base lines for batteries at Fort Michie, N. Y., $1,508; for the construction of fire-control stations for seventy-six 5-inch and 6-inch batteries, $190,000.

Mr. SHERLEY. Where are they located?

Gen. WEAVER. At different places about the country. Formerly the 5 and 6 inch batteries were not provided with complete range-finding equipment, but it was found that it would be very desirable to have equipment for the 5 and 6 inch batteries similar to that for the major caliber batteries. That was decided several years ago, and this is an estimate that has been submitted with a view to carrying out that policy. The next item is for the purchase of a site for fire-control station at Prospect Hill, Narragansett Bay——

Mr. **Sherley** (interposing). That should not come in here, should it?

Gen. **Weaver**. Yes, sir; sites for fire-control stations are carried in this item and expenditures for such sites have been made from the appropriations under this item.

Mr. **Sherley**. How much does that amount to?

Gen. **Weaver**. $21,000. That amount has already been expended in order to take advantage of an option, which would otherwise have lapsed this year. We would probably have had to pay more for the site later on.

Mr. **Sherley**. Do you mean that you have already bought that site out of the appropriation for last year?

Gen. **Weaver**. Yes, sir. Now, we want to make that good, that expenditure, by asking for the amount. The next item is for installation of fire-control cables at Fort Wetherill, underground, $9,654; installing fire-control cables at Fort Banks and Fort Heath, near Boston, $5,000; installation of post telephone system at Fort Banks, $2,100; installation of radio equipment at Fort St. Philip, $2,500; installation of fire-control switchboard at Fort Barry, $2,764; installation of fire-control cables at Fort Dade, $640; installation of radio station at Fort Terry, $1,300; an increased estimate for San Pedro—it was found that the estimate for San Pedro for 1917 was too small by $26,000, which we are now asking for; and for the unappropriated balance of the previous estimate for 1917, amounting to 17,982, making a total of 280,358 for the Engineer Department.

Mr. **Sherley**. When do you expect to spend this money?

Gen. **Weaver**. We expect to spend it during the ensuing year.

Mr. **Sherley**. Are you in a position to do that, or are the Engineers in a position to spend their part of it?

Col. **Winslow**. Of the money that has been allotted to us $21,000 is awaiting actual payment to the owners for land as soon as the title papers are completed. Of the other allotments made to the Engineers only $11,500 has not been spent.

Mr. **Sherley**. How about the future?

Col. **Winslow**. We expect to keep right up to date with the work as fast as the money is allotted to us.

Mr. **Sherley**. I have not added up those items, but they do not seem to make up the total of that estimate.

Gen. **Weaver**. The items I have menioned are only the Engineers' part of the estimate. The total estimate for the Signal Corps is $117,625, which is made up of the following items: For equipment of seventy-six 5 and 6 inch batteries, $99,256; for material for horizontal base lines for batteries at Fort Michie, $3,600.45; material for a 1-kilowatt radio set at Fort St. Philip, $5,060; material for a switchboard at Fort Barry, $2,608.62; fire-control material at Fort Banks, $2,100, making the amount of the total estimate $117,625.07. The estimate of the Ordnance Department for fire control is [illegible]12.50, as follows: For the new long-range 12-inch batteries: Plotting boards, $13,500; range boards, $2,475; depression position finders, $15,300; azimuth instruments, $11,700; wind component indicators, $450; deflection boards, $1,800; to the total of which should be added 25 per cent for increased cost of materials, amounting to $11,306.25, making the total for long-range 12-inch battery equipment $56,531.25. For the equipment of 5 and 6 inch batteries: For gun-plotting boards, $79,500; for gun-deflection boards, $13,800; for gun-range boards, $17,875; wind component indicators, $3,250; for six mortar plotting boards, $9,000, or a total of $123,425, to which should be added 25 per cent for increased cost, amounting to $30,856.25, making the total of the estimates for the Ordnance Department $210,812.50. The sum of the total estimates for the three departments is $608,796.21.

Mr. SHERLEY. Do you know whether the ordnance people will be in a position to supply those instruments or whether they will be able to use this money?

Gen. WEAVER. Yes, sir; they will be able to supply the instruments within the next year. I think there is no question about their ability to do that, as there has been no delay in the construction of this class of material in the past. Much of it is obtained by contract.

Mr. SHERLEY. If you are allowed this sum, how near will you be to completing the fire control for the existing batteries, not having in mind new armament that may be added?

Gen. WEAVER. Under the estimates heretofore submitted, it will require about $950,000 in addition to the amount asked in this bill.

Mr. SHERLEY. What amount of these estimates is for the fire control of 5 and 6 inch batteries?

Gen. WEAVER. The estimates submitted here under the different departments for the 5 and 6 inch batteries amount to about $430,000.

Mr. SHERLEY. Last year you testified that it was estimated that $359,000, in addition to the funds included in that year's estimates. would be required for the 6-inch and smaller batteries. Now, this year you are estimating $430,000 for that. That is an increase of $61,000 as compared with your statement of last year. What is the cause of this increase?

Gen. WEAVER. Approximately $30,000 is due to the increased cost of equipment supplied by the Ordnance Department, and the remaining $31,000 is due to increases in the estimates of the Engineer Department and Signal Corps.

Mr. SHERLEY. You do not expect to equip the 3-inch batteries?

Gen. WEAVER. No, sir.

Mr. SHERLEY. Will you complete the installation for these batteries if this amount be appropriated?

Maj. EMBICK. Yes, sir; the 5 and 6 inch batteries will be completed with this amount.

Mr. SHERLEY. And if we give you this estimate, we will not have to give you any more on account of those 5 and 6 inch batteries?

Maj. EMBICK. That is true, unless present plans are changed.

Gen. WEAVER. My understanding is that this amount will finish the installation of fire-control equipment for the 5 and 6 inch batteries.

Mr. SHERLEY. If I understood the reading of the various items, the other matériel item is for the obtaining of the instruments in connection with the fire control of the 12-inch guns that are to be mounted for high-angle fire.

Gen. WEAVER. Yes, sir.

Mr. **Sherley**. That will provide for how many?

Gen. **Weaver**. It will provide for 17 guns.

Mr. **Sherley**. Arranged in how many batteries?

Gen. **Weaver**. In nine batteries, with two guns to each battery.

Mr. **Sherley**. In view of the fact that you have no emplacements built for any of them yet, and no carriages finished, is there any need at this time for appropriating this money?

Gen. **Weaver**. These particular carriages—those for long-range fire—are considered an emergency matter.

Mr. **Sherley**. I understand, but there is no use in getting the fire-control instruments ready before the carriages and emplacements are ready.

Gen. **Weaver**. My understanding is that the batteries will be ready within a year, and this equipment ought to be available the instant they are ready.

INSTALLATION AND REPLACEMENT OF ELECTRIC LIGHT AND POWER PLANTS IN UNITED STATES.

Mr. **Sherley**. Colonel, the next item in which the Engineers are interested is "For installation and replacement of electric light and power plants at seacoast fortifications." Last year you asked $110,000, and we gave you nothing, and this year you are asking the same sum. Is that for the same purpose?

Col. **Winslow**. For the same purpose. Sixty-nine thousand dollars of it is for the defenses at San Diego, purchase and installation of six generating sets, and $41,000 is for the purchase of six generating sets for Los Angeles. The latter are to be installed in rooms of the new batteries, which accounts for the fact that we want $69,000 for the same number of generating sets in one place and only $41,000 for the same number at another place.

Mr. **Sherley**. The Congress last year eliminated this item, due to the statement, as I recall, that you would not be in position to need the money before this bill became a law.

Col. **Winslow**. Yes.

Mr. **Sherley**. And you have now reached the point in the work at these two fortifications which makes it necessary to have this fund?

Col. **Winslow**. Yes.

Mr. **Sherley**. And if it is allowed in its entirety it will complete the installation of the electric light and power plants at those two points?

Col. **Winslow**. Yes, sir; except that it does not cover the power plants needed for searchlight purposes. That item comes under the appropriation for searchlights.

Mr. **Sherley**. I understand, but for the purposes that this covers it completes for these two places?

Col. **Winslow**. Yes.

PURCHASE AND INSTALLATION OF SEARCHLIGHTS IN UNITED STATES.

Mr. **Sherley**. "For purchase and installation of searchlights for the defenses of our most important harbors, $250,000." I note, first, you have stricken out the language "the defenses of our most important harbors" and substituted "seacoast defenses."

Col. WINSLOW. That was in order to make it a little more general. "For the defenses of our most important harbors" was the original draft. At that time it was supposed it would only be at the most important places that we would need any such equipment.

Mr. SHERLEY. There has been no trouble on account of any ruling of the comptroller?

Col. WINSLOW. No, sir.

Mr. SHERLEY. It is simply a matter of using better phraseology?

Col. WINSLOW. Simply a matter of having the wording of the law agree better with what is intended.

Mr. SHERLEY. Last year you asked for $226,700, and you got it all.

Gen. BLACK. Yes, sir.

Mr. SHERLEY. That was for the purchase and installation of searchlights at San Diego and Los Angeles?

Col. WINSLOW. Yes, sir.

Mr. SHERLEY. Now, what have you done with that money?

Col. WINSLOW. We have not actually expended any of that money on account of the recent development in searchlight matters. The first high-intensity searchlight we were able to get hold of was turned over to us in May last year. It was later sent down to Fort Monroe for test and comparison with the existing lights, and that test was completed some time since, and it appeared that this new light is very much better than the old.

The new searchlight is the Sperry light, invented by the same man who invented the gyroscopic compass and a lot of other things. In the meantime the General Electric Co. has had under development what is known as the Beck light. The inventor of this is a foreigner. The Beck light was introduced some years ago in out Navy in the 36-inch size, but we wanted 60-inch lights, and it is only within the last six weeks that they have delivered at Fort Monroe the first new Beck 60-inch light.

Mr. GILLETT. What does that mean? Does that mean the mirror itself is 60 inches?

Col. WINSLOW. That the mirror is 60 inches in diameter. There is now in progress a competitive test between the Beck light and the Sperry light, both of them high-intensity lights.

Mr. SHERLEY. Is the Beck light on the same principle as the other one, which, as I recall, is the feeding of a constant flow of cool air, which serves to keep the points of the carbon cool, and thereby enable you to have a greater current and a more intense flame?

Col. WINSLOW. Yes, sir; the general principle is the same. The Sperry light uses air for cooling, whereas the Beck light uses alcohol vapor.

Mr. SHERLEY. And you have not expended this money awaiting the result of this competitive test?

Gen. WEAVER. That report has been received. I did not know whether you knew it or not.

Col. WINSLOW. We received a report of the comparative tests between the Sperry and the old light, but not as between the Sperry and the Beck light. The Beck light has just arrived.

Mr. SHERLEY. In the event either one of them was adopted in place of the old light, will it mean an increased cost in these units?

Col. WINSLOW. We have no actual figures for the sale to the United States of the high-intensity lights in large quantities. We only know the price of these two experimental lights—or, rather, one experimental light, because the Sperry light was the changing of an old light. We only know that it exceeds somewhat the cost of the old General Electric lights; but we have reason to believe that if purchased in large numbers we can get them at a cost of not much more than we used to pay for the old ones.

Mr. SHERLEY. How soon do you expect to spend this $226,000 for these two harbors?

Col. WINSLOW. At the time that estimate was put in these lights mentioned were under contract, and it was expected that the General Electric Co. would deliver the Beck light last May, but they only did it a short time ago. The Beck light has a very good name from the Navy, in the smaller size; and we thought before we expended money for purchasing these high-intensity lights in quality, it was wise to have a competitive test between the two types. We have heard informally that the Sperry light has turned out better than the Beck. The Beck people have had some difficulty in the mechanism of the light itself; some difficulty in getting carbons that are exactly suitable, so that we expect the Coast Artillery board will report in a very few days that the Sperry light is the better light. When the report is received we expect to immediately ask for bids; in fact, the engineer depot has in preparation now, and almost completed, the specifications asking for bids on these lights.

Mr. SHERLEY. Making the mirror and a lot of things besides the light and the way the light is created enter into the cost, so that the change you contemplate is a change that relates only to part of the assembled unit?

Col. WINSLOW. Yes, sir.

Mr. SHERLEY. Now, what delay is there going to be in installing the units at Los Angeles and San Diego as a result of waiting on these tests?

Col. WINSLOW. Probably the length of time we waited from last summer, when the money was available, up to the present time.

Mr. SHERLEY. Have the other things that go to make the completed searchlight been obtained; for instance, the mirrors?

Col. WINSLOW. The mirror comes in the contract with the light; but there will be no delay in that, since they are manufactured now in this country. The power plants for these lights are under contract now.

Mr. SHERLEY. Will you be able to install these searchlights before the batteries are ready to go in commission?

Col. WINSLOW. I think so.

Mr. GILLETT. Where is the Sperry light made?

Col. WINSLOW. In Brooklyn.

Mr. SHERLEY. Then there will be no delay as a result of this test?

Col. WINSLOW. I think there will be no delay.

Mr. SHERLEY. You are asking for $250,000 this year for these lights. Where do you expect to place them?

Col. WINSLOW. We expect to take a part of that amount and use it to change about 50 of the old standard General Electric lights into new high-intensity lights. With the remainder we expect to purchase additional new lights to go toward the completion of the searchlight program.

Mr. **Sherley.** To be placed where?

Col. **Winslow.** At various places. The number yet to be supplied, according to this table which is submitted every year, is approximately 50.

Mr. **Sherley.** You will put in the hearings a table, brought up to date, showing those that are provided and under order, and those which the project requires and the places?

Col. **Winslow.** Yes, sir.

STATUS OF PROJECTS—ALL HARBORS IN UNITED STATES.

The statement of project requirements below is based on figures prepared by the Office of Chief of Coast Artillery, and, in the cases of harbors where definite searchlight schemes have not been adopted, is understood to be based on the assignment adopted by the Taft Board, of two searchlights to a battle commander and one illuminating light to a fire commander, together with mine lights.

Locality.	Provided or under order.					Project requires—			Yet to be supplied.	
	24-inch.	30-inch.	36-inch.		60-inch.	30-inch.	36-inch.	60-inch.	36-inch.	60-inch.
			Fixed.	Portable.						
Kennebec River							2		2	
Portland		2	1		8	2	1	10		2
Portsmouth	1		1	1a			3	5	2	5
Boston	2		4		8ab		4	10		2
New Bedford	1			1a			2	2	2	2
Narragansett Bay	3	3	3		3c		1	8		5
New London	1				14			14		
Eastern New York		1	1		4		3	4	2	
Southern New York		1	3		10b		2	13		3
Delaware		2					5	5	5	5
Baltimore	1		2				3	5	1	5
Potomac		2			1		4	2	4	1
Hampton Roads	1	1	3		6			11		5
Cape Henry								6c		6
Cape Fear	1		1		1		4	2	3	1
Charleston		1			1		5	2	5	1
Savannah	1			1	1		4	2	4	1
Key West		1		1	1		4	2	4	1
Tampa	2			2	1		3	4	3	3
Pensacola			2	1	1		5	4	3	3
Mobile		1			1		5	3	5	2
New Orleans							3	3	3	3
Galveston			1		1		7	2	6	1
San Diego		1	1		8f			8		
Los Angeles					7g			7		

a=two 36-inch portable lights and one 60-inch light have been shipped to Gloucester for temporary use in connection with test of the Hammond torpedo. These lights were removed from the following localities: Portsmouth, N. H., one 36-inch portable; Boston, Mass., one 60-inch; New Bedford, Mass., one 36-inch portable.

b=Five 6-inch lights originally purchased for reserve and afterwards assigned to Boston and New York; are now held at Washington Barracks. These lights were accounted for last year as follows: Boston, 2; New York, 3. The statement of 60-inch lights provided for Boston and New York has been modified accordingly.

c=Two 60-inch lights actually on hand at Narragansett Bay. Funds are available for an additional 60-inch light, but the light has not yet been ordered.

e=New project.

f=Two 60-inch lights actually on hand at San Diego. Funds are available for six additional 60-inch lights, but the lights have not yet been ordered.

g=Funds are available for seven 60-inch lights for Los Angeles, but lights have not yet been ordered.

Locality.	Provided or under order.					Project requires—			Yet to be supplied.	
	24-inch.	30-inch.	36-inch.		60-inch.	30-inch.	36-inch.	60-inch.	36-inch.	60-inch.
			Fixed.	Portable.						
San Francisco	....	2	1	1	11[a]	2	4	11	3	....
Columbia	....	4	....	1	4	....	5[b]	4	5	....
Puget Sound	....	2	....	2	16[c]	....	....	16	....	....
Coast Artillery School	....	....	....	1	3[d]	....	....	....	....	....
Washington Barracks	4	4	1	1	7[e][d]	....	....	....	....	....
Total	18	28	25	13	118	4	79	165	62	57[f]

a=Nine 60-inch lights on hand at San Francisco. Funds are available for two additional 60-inch lights, but the lights have not yet been ordered.

b=The project for the defenses of the Columbia also includes one 36-inch portable light. This light has been installed.

c=Fourteen 60-inch lights are actually on hand at Puget Sound. Funds are available for two additional 60-inch lights, but the lights have not yet been ordered.

d=For the purpose of conducting test of the Sperry and Beck lights, two 60-inch General Electric lights have been modified to take the Sperry lamp mechanism, and two new 60-inch Beck lights have been purchased. One light of each type has been shipped to Fort Monroe for test by the Coast Artillery Board. One Sperry light is at the plant of the manufacturer, and the remaining Beck lights is at Washington Barracks.

e=Five 6-inch lights originally purchased for reserve and afterwards assigned to Boston and New York; are now held at Washington Barracks. These lights were accounted for last year as follows: Boston, 2; New York, 3. The statement of 60-inch lights provided for Boston and New York has been modified accordingly.

f=The statement prepared last year showed sixty-three 60-inch lights remaining to be provided. Since that time, it has been decided that five 60-inch lights, accounted for in last year's statement as provided for Boston and New York, should be held at the engineer depot, Washington Barracks, for a reserve. This change increased the number of lights remaining to be supplied by five (two for Boston and three for New York). A new project adopted for Portsmouth, N. H., requires five 60-inch lights instead of the two 60-inch shown on last year's statement. So that, at the beginning of the present fiscal year, there actually remained to be provided seventy 60-inch lights. With funds appropriated in the 1917 act, thirteen 60-inch lights will be supplied (six for San Diego and seven for Los Angeles), leaving fifty-seven 60-inch lights yet to be supplied.

Mr. SHERLEY. Has there been any change in the project for searchlights at the fortifications as a result of review by any boards?

Col. WINSTOW. No material changes. In connection with this estimate for changing the old searchlights into high-intensity lights we would like the authority of Congress to expend the amount in the near future out of the funds already appropriated instead of waiting for a new appropriation. The Engineer depot is now attending to this matter, and we expect, if we can get the authority, to give the order very soon. This will provide for changing 50 of the existing lights, which is about one-half of what we now have.

PROTECTION, PRESERVATION, AND REPAIR OF FORTIFICATIONS IN THE UNITED STATES.

TORPEDO STRUCTURES.

Mr. SHERLEY. The next item is "For protection, preservation, and repair of fortifications," etc. Last year you asked $250,000 and received $250,000—$25,000, however, of it being intended for the preservation of historic fortifications and $225,000 as the usual maintenance item. What is the condition of your balances, Colonel, under this item?

Col. WINSLOW. There is actually in the hands now of the district officers for ordinary preservation work not yet expended $132,000. Since the last appropriation went into effect a new policy with regard to preservation and repair has been adopted, which Gen. Black will explain.

Gen. BLACK. I served for a number of years as department engineer officer and I found that although the commanding general of a department was responsible for the fighting efficiency of his entire command, he could not have this fence whitewashed rather than another at a fortification without going to the Chief of Engineers. In addition to that, if he wanted to inspect a fortification, the engineer officer in charge of construction and repair was not under his orders, and there being a little question of dignity involved, as a general rule, although he would like to have that officer with him, he did not ask him to come because he could not order him to come. I made up my mind that for those items—where it is a question simply of repair and not of structural alteration—it did not make a particle of difference to the Engineer Department whether this battery was painted or that one, and it did make a great deal of difference to the department commander, and I made up my mind that those funds should be expended under his direction for current repairs, and that the engineer officer in charge of preservation and repair work should be under the orders of the department commander as far as relates to that work. This policy has now gone into effect in accordance with a modification in Army regulations, and the funds are now allotted under the orders of the department commander to the various works. This plan seems to be working very well and to be rather conducive to a better spirit. Structural changes are handled just as they were before.

Mr. SHERLEY. About six months of the year have gone and you have spent a little less than 50 per cent of your moneys. Have you been able to keep up with your repairs?

Col. WINSLOW. I think so. During the winter months, as a rule, at the northern posts there is very little work in the way of preservation and repair. The principal work of preservation and repair comes with the general spring cleaning, and immediately after target practices.

Gen. BLACK. This change in policy made a little delay, too. It took me a long time to get it through the War Department, for some of the reasons that you may find out later. The Chief of Coast Artillery was entirely agreed and everybody else was agreed, but nevertheless it took me several months to get it through.

Mr. SHERLEY. Do you expect to be able to take care of all of the items with this $225,000?

Col. WINSLOW. For this year; yes, sir.

Mr. SHERLEY. Will you have any surplus?

Col. WINSLOW. I think the surplus will be less than it was last year.

Mr. SHERLEY. This is $25,000 more than we gave you heretofore?

Col. WINSLOW. That $25,000 for old fortifications——

Mr. SHERLEY. I want to come to that a little later. I say, this was $25,000 more than you had usually?

Col. WINSLOW. Yes, sir.

Mr. **Sherley**. And you gentlemen were complaining about being held down a little bit too close from the fact that there was an increasing amount of property to be taken care of, due to new fortifications going into commission.

Col. **Winslow**. At the present time less than one-third of the money is unallotted.

Mr. **Sherley**. Have these expenditures been made on a general character of repairs, or have you had to make any large expenditures anywhere?

Col. **Winslow**. We have had a few special items. The largest item is $7,500 for gun covers at Boston, Mass.; that is, to go over the guns and keep the snow out during the winter time.

Gen. **Weaver**. So that the guns will be available for use at any time.

Gen. **Winslow**. The other special items have been comparatively small and were at special places; for instance, there is one for Mobile, we had to make a special item of $3,600 in order to repair damage caused by a storm.

Mr. **Sherley**. You ask this year for $300,000. Assuming that that includes $25,000 for the preservation of historic fortifications, it would show an increase of $50,000 for your general maintenance item. If you got along this year pretty well, why do you need $50,000 for next year?

Col. **Winslow**. In addition to the appropriation for the preservation and repair of fortifications there was formerly an appropriation for the preservation of structures for the torpedo defense of the United States. It now is all included in one item.

Mr. **Sherley**. But that has been true for a couple of years or more?

Col. **Winslow**. Last year was the first year, sir.

Mr. **Sherley**. Year before last you got along on $200,000, but because of the addition of the torpedo-defense structures and your general complaint we gave you $25,000 additional, and now you want $50,000 more?

Mr. **Gillett**. How much was the torpedo appropriation?

Col. **Winslow**. About $25,000 a year.

Mr. **Sherley**. Why do you want an additional $50,000 this year?

Col. **Winslow**. It was figured that these older batteries are getting older all the time and that we are going to have new ones, such as at Los Angeles, placed on a maintenance basis. For this reason we need a larger preservation and repair item. Then, there must be taken into account the increased cost generally of all materials, and there will be an increased cost of labor.

Mr. **Sherley**. But your new batteries at San Pedro should not have much maintenance cost for them?

Col. **Winslow**. Not very much.

Mr. **Sherley**. There is, perhaps, some reason for the additional amount because of the increased cost of material and labor?

Col. **Winslow**. That would be an increase of about $50,000 out of $225,000, which is less than 25 per cent, and labor and materials have gone up fully that much.

Mr. **Sherley**. But a good deal of your labor is not outside labor?

Col. **Winslow**. A good deal of it; yes, sir.

Mr. **Sherley**. Is not much of the work done by the men there?

Col. WINSLOW. Some little, but a large proportion of the work has been done with outside labor, and especially has that been true in the recent past while the garrisons have been so small. Some years ago there was introduced the custom of having the Engineer Department furnish to the Artillery paints and various other cleaning-up materials, and a part of the work was done by the garrisons. But in the recent past large proportions of the garrisons have been on the border.

PRESERVATION OF HISTORIC FORTIFICATIONS.

Mr. SHERLEY. What have you done with the $25,000 that was given for the preservation of old historic fortifications?

Col. WINSLOW. The district officers have all been asked for a detailed report of exactly what they need with the idea that we will do the main part of the work next season. Two thousand three hundred and twenty-five dollars has actually been expended out of that fund up to date.

Mr. SHERLEY. Last year you submitted what purported to be a statement as to the cost of preserving some of these old fortifications, with the amounts at each place and what would be the annual maintenance cost after that.

Col. WINSLOW. We had that, but we have not yet begun to expend it except, as I say, the small amount mentioned.

RESTORATION OF SEA WALLS.

GALVESTON, TEX.

Mr. SHERLEY. Last year we gave you $303,500 for the repair and restoration of sea walls, retaining walls, and fill, and for urgent repairs to batteries in the defenses of Galveston, Tex.?

Col. WINSLOW. The funds have been allotted to the district officer and the work is under way.

Mr. SHERLEY. Are you going to be able to complete the job for that amount of money?

Col. WINSLOW. I think so; yes, sir; but the completion will not be within this fiscal year; it is a larger job than that.

Mr. SHERLEY. There has never been a determination as to the title of that land there which prevents the undertaking of the repairs to some of the fortifications?

Col. WINSLOW. That subject is covered by an item in the rivers and harbors bill, which prevents a large appropriation from becoming available until the title matter has been satisfactorily settled.

Mr. SHERLEY. Have they ever straightened out that matter of title?

Col. WINSLOW. They are working on it now.

Mr. SHERLEY. You are not asking money for the repair and restoration of the sea walls there this year?

Col. WINSLOW. No, sir.

PREPARATION OF PLANS FOR FORTIFICATIONS.

Mr. SHERLEY. You are asking for the preparation of plans for fortifications and other works of defense $25,000. Last year we gave you $25,000, which was $15,000 more than the year before and $20,000 more than had annually be appropriated theretofore. How have you gotten along with that money?

Col. Winslow. That money is all allotted with the exception of about $4.300, and that is to be distributed amongst the districts on the Pacific coast in connection with the preparation of plans. The work there has been somewhat handicapped by the shortage of engineer troops, they having been on the border. But we hope soon to have some of them back and it is expected that in the very near future the companies will be sent out on surveys around in the neighborhood of the mouth of the Columbia and in the Puget Sound district. As soon as that work starts, the district officers will need the funds for the preparation of the plans, and the remaining amount of this appropriation is to be allotted to them.

Mr. Sherley. The reason for the increase, as I recall, was largely in order to prepare plans for the land defense of the fortifications, while the $5,000 formerly allotted was for the ordinary work on plans for the fortifications themselves.

Col. Winslow. The preparation of typical plans.

Mr. Sherley. Yes. In recent years there has been a program under way looking to the working out of detailed plans for the land defenses of all the fortifications, the idea being not to put them into effect until hostilities broke out or just preceding hostilities, and to have them so arranged that they would have such a reserve of materials as may be necessary. That is true, is it not?

Col. Winslow. Those are the facts.

Mr. Sherley. You have never undertaken, have you, to get appropriations for increasing your reserve of materials?

Gen. Black. No, sir; it would amount to such an enormous sum that in talking it over with the Chief of Staff it was decided that it would not be advisable to put it before Congress when we wanted so much money for guns and things of that kind. It seemed to me that while necessary it was not so immediately necessary as the supply of ordnance and ammunition. However, I was directed to continue making the estimates and to submit the matter to the board of review for submission to Congress.

Mr. Sherley. You have been going forward, however, with the working out of the plans?

Gen. Black. Oh, yes, sir. Before I became chief of engineers that was the principal item of my military work.

Mr. Sherley. Colonel, your financial statement shows that you have practically had occasion to use all of this money and will use it all?

Col. Winslow. All of the money; yes, sir.

Mr. Sherley. And you contemplate the same thing in the next year?

Col. Winslow. Yes, sir. For many years the appropriation was $5,000, and it was simply for the preparation of typical plans for seacoast defenses. For a long time the question of the land defenses was allowed to sleep, but two or three years ago the responsibility for keeping the land defense plans up to date was placed on the departmental commanders instead of continuing in the War College as it had been. Since then there has been a great deal of work done on the plans, and we ask the committee for the necessary money to do the work.

MAINTENANCE AND REPAIR OF SEARCHLIGHTS, ELECTRIC LIGHTS, AND POWER EQUIPMENT IN UNITED STATES.

Mr. Sherley. The next item is, "For maintenance and repair of searchlights and electric light and power equipment for seacoast fortifications, and for tools, electrical and other supplies, and appliances to be used in their operation, including the purchase of reserve lights." The estimate is $40,000, which is the amount of the current appropriation. What is the condition of your balances?

Col. Winslow. $34,000 had not been actually expended on October 31. We actually spent last year about $41,000, which shows that we are keeping up with the appropriations?

Mr. Sherley. Take the year before appropriation—did you spend all of that in that fiscal year?

Col. Winslow. It is not a fiscal year appropriation.

Mr. Sherley. But did you actually expend it in that fiscal year?

Col. Winslow. We were a little short of expending it all. I think we spent about $36,000. Some years we run a little short of the $40,000 and some years we run a little over.

Mr. Sherley. How much is the balance?

Col. Winslow. $34,000, that being nearly all in the hands of the district officers.

Mr. Sherley. You mean that it has been allotted?

Col. Winslow. Yes, sir; it has been allotted, except about $8,000 which we are keeping for emergencies. The remainder is in the hands of the district officers, and up to October 31 had not actually been spent. We have still about three-fourths of the fiscal year to go, from October.

Mr. Sherley. How much did you have on hand the 1st of July from the appropriation for the year before last?

Col. Winslow. I have not the exact figures as of the 1st of July, but we had $5,000 unallotted last January of the $40,000 previously appropriated. $2,000 has since been turned in from savings on old funds, and about $39,000 has been allotted to the district offices.

MINING CASEMATES, CABLE GALLERIES, ETC., FOR SUBMARINE MINES IN THE UNITED STATES.

Mr. Sherley. The next item is "For construction of mining casemates, cable galleries, torpedo storehouses, cable tanks, and other structures necessary for the operation, preservation, and care of submarine mines and their accessories, and for providing channels for access to torpedo wharves, $250,000." Last year you asked for $254,060, and we gave you $200,000. What have you done with that?

Col. Winslow. That estimate of $254,000 included a number of items. The storehouse item for Cape Henry was cut out so as to come down with the appropriation. Out of the remainder, $51,000 was actually allotted to the district officers for work. The amount for Los Angeles, which is about $24,000, is ready to be allotted, the plans being now in. Another item was $21,000 for Fort Levett, for two casemates, but subsequently it was decided to make a single large casemate instead of two smaller ones, and the plans were redrawn and have just gone up for approval to the Board of Review. Then there were the items that related to Cape Henry, amounting to

$94,000, in addition to the one that was knocked out. No work has been done on those.

Mr. **Sherley.** The Cape Henry items amounted to about $160,000?

Col. **Winslow.** Yes, sir; about $160,000 in all, including the item cut out.

Mr. **Sherley.** And none of that has been expended?

Col. **Winslow.** No, sir. There is one thing in connection with those casemate estimates which deserves remark. The plans for the casemates we have been building previously have had no direct overhead protection—that is, protection against bombs that might be dropped from airships, and to plunging shells from distant vessels. Owing to recent developments abroad, we have under study the question of adding overhead protection to our older casemates and in building the new ones with such protection, so that that work in the future will probably be more expensive than it has been. For instance, for the work up in Maine the original estimate was $21,000, but the actual cost will probably be increased to something over $30,000.

Mr. **Sherley.** Have you done any of that work?

Col. **Winslow.** That work has not been done yet.

Mr. **Sherley.** I thought you said that everything except at Cape Henry——

Col. **Winslow** (interposing). I said that the plans for the Maine work had gone up for approval. The cost will be greater than the estimate.

Mr. **Sherley.** Did you not have a plan to submit?

Col. **Winslow.** Yes, sir; but it did not provide for overhead cover.

Mr. **Sherley.** So you have held them up to make new plans?

Col. **Winslow.** Yes, sir; to provide overhead cover.

Mr. **Sherley.** Has there been enough accuracy displayed—or, rather, has there been enough destructiveness shown—from the dropping of bombs from aeroplanes to warrant this? I have rather gotten the impression from abroad that whenever these people hit anything it was purely an accident.

Gen. **Black.** In additional to the bombs from the aeroplanes, we have this development of very long-range fire, which makes the drop of the projectile much greater than ever occurred before. There is very much greater need to-day from overhead protection for our essential structures than there was prior to the development of the long-range naval fire, and those structures are necessarily more or less exposed. For instance, take the situation at Fort Revere, where there are structures in the rear of the batteries behind the hill. If ships fired from the old fighting range of 6,000 yards any structures in behind that hill would be perfectly safe, because the trajectory is so flat that the projectiles missing the battery would go into the hill or over it: but with the long-range fire we have now a shot that would at the old range come down that way [indicating] would be liable to come down in this way [indicating] and damage the power house, which is almost directly in the rear of those batteries.

Gen. **Weaver.** I think that fire from aeroplanes is more accurate than you indicated.

Mr. **Sherley.** I gathered the impression from talking with officers and from what I read that the dropping of bombs from a height of from 5,000 to 10,000 feet was very inaccurate.

Gen. Weaver. Some experiments were made in Paris a couple of years ago at a height of 5,000 feet. They dropped bombs on a large piece of cloth, and I understand that one aviator made a hit 3 times out of 10.

Mr. Sherley. Under this item you are asking $250,000. We cut it last year by $54,060, which, as I recall, was one of the estimates for Cape Henry, and that was done because there was no need of it at that time. Now, that situation certainly still applies to Cape Henry.

Col. Winslow. That estimate of $250,000 submitted this year includes that item. I can give you the items, if you want them.

Mr. Sherley. We will be glad to have them.

Col. Winslow. The items are as follows: Two thousand dollars for modification of the loading rooms, tramway, etc., at Fort Wright, on Long Island Sound; $147,000 for Cape Henry, including duct systems, cable tanks, storehouse, loading rooms, service and storage magazine, a small dormitory for the guard, and a fence around the site which has been purchased; $57,000 for the torpedo defense of Galveston. The buildings are to go on that land about the title to which there is some question. The State is now using it for a quarantine. The State is now using it for a quarantine station. Then there is an item of about $50,000 for Los Angeles, and then a very small item for some work at the mouth of the Columbia River. These items sum up slightly over $250,000, but that figure was determined on as a lump sum.

Mr. Sherley. The Galveston item and Cape Henry item are not really needed at this time, are they?

Col. Winslow. If we had the money, we could spend it. There will be no other money available for 18 months after this appropriation is made, and we are counting on all those difficulties being removed before that time.

Mr. Sherley. It will be 15 months.

Col. Winslow. It is 18 months from the present time.

Mr. Sherley. What good would these things do there prior to putting up any batteries there?

Col. Winslow. At Galveston we have batteries.

Mr. Sherley. But do you expect to get that land situation settled and is there not a big fill to be made there first?

Col. Winslow. Not where these buildings are to go. They go back in the interior on the harbor front, not on the sea front, where the bill is to be placed.

Mr. Sherley. How about Cape Henry—you will not have any batteries there?

Col. Winslow. We will not have the guns there; no, sir.

Mr. Sherley. Is it not just something to be shot at?

Col. Winslow. But the question is that the work must be done at some time, and it can be done now more cheaply in connection with the batttery construction.

Mr. Sherley. That may be a good reason for doing it.

Gen. Weaver. There is another, and that is it will take several years to complete the batteries there, and meanwhile this may be the only defense we will have.

Mr. Sherley. Could you use this defense without the batteries?

Gen. Weaver. Until the mine defenses are destroyed.

Mr. Sherley. But, ordinarily, you never put up the mine defense until you have a secondary battery to protect it.

Gen. Weaver. We might improvise a secondary battery to protect it.

Mr. Sherley. Of the $200,000 you have got, more than half of it was to be expended on account of Cape Henry. Now, is this amount in your estimates this year a duplication of that, or is it additional?

Col. Winslow. It is a duplication only in so far as the item that was dropped out last year is concerned, that being restored. The other items are not duplicated in this at all. Of that estimate of $160,000 for Cape Henry last year, $52,000 was for the casemates and $65,000 for the storehouse and $40,000 for the wharf. This year the only one of those items that is duplicated is the storehouse, which was cut out of last year's estimate. The other items are all in addition.

Mr. Sherley. Apparently, you are going to be pretty much restricted in what you do at Cape Henry in the way of building for some time. You spoke of the saving that could be made in doing this work along with other work, but your other work there will run along for two or three years.

Col. Winslow. Fully three seasons.

Mr. Sherley. Will there be any economy in starting this work now?

Col. Winslow. Possibly not.

SITES FOR FORTIFICATIONS—ROCKAWAY BEACH, FISHERS ISLAND, LONG ISLAND SOUND, SAN FRANCISCO, AND LOS ANGELES.

Mr. Sherley. The next item is "For procurement or reclamation of land, or rights pertaining thereto, needed for site, location, construction, or prosecution of works for fortifications and coast defenses," you are asking $100,000.

Before going into that, you asked last year for $1,867,000, which, as I recall, was for the purpose of buying a site at Rockaway Beach, and for buying some land at San Pedro and also at San Francisco.

Col. Winslow. That is correct; and also a small amount in addition for a right of way connecting two portions of the Fort Wright Reservation on Fisher's Island.

Mr. Sherley. What is the status touching those various sites? What did you do at San Pedro?

Col. Winslow. The amount appropriated—$1,400,000—was less than the estimate had been for Rockaway Beach, and since Rockaway Beach is considered by far the most important, and as it was not absolutely certain as to what we would have to pay for a site there, we have not spent any of the money except $8,000 for the fort at Long Island Sound. We have not bought the land at Los Angeles or the land at Lake Merced.

There is one point in connection with the purchase of the right of way at Fishers Island; there are two portions of the post, and between the two there is a small length of the roadway which the Government owns and uses as a right of way. To build the new 16-inch battery, it will be necessary to construct a railroad over a more practicable line connecting the two sections of the post, and when we undertook to get title the owners of the land were willing to give it to us, but they did not wish to have the little square that would be left completely surrounded by a Government reservation, so they are holding up the sale of the new right of way and asking that the Government will deed to them the old right of way.

Mr. **Sherley.** As I understand you, nothing has been done at San Pedro?

Col. **Winslow.** Nothing has been done as to the acquirement of sites.

Mr. **Sherley.** What do you propose doing?

Col. **Winslow.** The idea we had was we would wait until we found out what money we had left after purchasing what we thought was the more important site at Rockaway.

Mr. **Sherley.** In the meanhile your fortification at San Pedro is nearing completion. Will you not be delayed by failure to have the site and to do the work on it?

Col. **Winslow.** We hope not.

Mr. **Sherley.** That site was an incident to the inauguration of the fire-control system.

Col. **Winslow.** Yes.

Mr. **Sherley.** Are you submitting an estimate for the fire-control system there?

Col. **Winslow.** That is included, is it not?

Maj. **Embick.** I think not.

Col. **Winslow.** I do not know about the fire-control estimate.

Maj. **Embick.** It is not included.

Mr. **Sherley.** If you do not get the money for the fire control and do not get the site, how do you hope to get it finished in time for the use of that battery? You expect to finish the battery with the moneys you get here.

Maj. **Embick.** It will not be finished in time.

Mr. **Sherley.** Do you not think that is a rather unnecessary delay?

Col. **Winslow.** We have the funds, and we had hoped to get this Rockaway Beach matter pushed through quickly and promptly, so we would know what we had left; and if, as we expected, we had the money left over, then we were going right forward and purchase that site, and also that at Lake Merced.

With regard to the purchase of right of way connecting the two tracts of land now owned for fortification purposes on Fisher's Island, it is expected within a short while a request will be made to the committee to insert in the bill a provision authorizing the Government, in obtaining the new right of way, to offer in exchange the old right of way.

Mr. **Sherley.** Now, suppose you tell us just the situation in connection with the purchase of land at Rockaway Beach.

Gen. **Black.** Negotiations are in progress through an agent employed by the United States thoroughly conversant with the conditions of real estate, purchase and sale, on Long Island and vicinity. We decided not to take advantage of the option that was given, deeming the price too high. We opened up negotiations with the owner of the land, and, as I understand it, have come to an agreement with the owner as to the price for the high land.

Mr. SHERLEY. The question of title as to the land which is under water and which is being respectively claimed by the city of New York and the owners of the high land has not yet been determined?

Gen. BLACK. That has not yet been settled, but is being now considered between the owner and the city of New York, and I am informed that this matter will be settled in the very near future.

Mr. SHERLEY. The question of the title of the Southern Pacific to the high land was gone into by the department?

Gen. BLACK. Yes, sir.

Mr. SHERLEY. In connection with the question as to whether their title was good as against the United States?

Gen. BLACK. Yes, sir.

Mr. SHERLEY. What conclusion was reached?

Gen. BLACK. The question was referred to the Judge Advocate General as to whether proper search had originally been made as to the validity of that title, and as to whether the court proceedings had been so conducted as to make it improbable that any change would be made in the decision on appeal. The Judge Advocate General, in a written opinion, stated that after a careful examination into the entire matter he was convinced that the search made by the Department of Justice was full and adequate, and that title did not rest in the United States.

Mr. SHERLEY. The law requires that before mony shall be actually paid over for the purchase of any land, proper deeds conveying title shall have been submitted to and approved by the Department of Justice?

Gen. BLACK. Yes, sir.

Mr. SHERLEY. So that in the event you arrive at a satisfactory price with the Southern Pacific touching this land, before payment is made there will have to be another and final determination by the Department of Justice of the fact that title vests in and is conveyed by the Southern Pacific in fee simple to the United States Government?

Gen. BLACK. Yes, sir.

Mr. SHERLEY. Do you believe that a purchase upon the new terms will represent a fair value of the land?

Gen. BLACK. So I am informed.

Mr. SHERLEY. It represents a less sum than the original option given?

Gen. BLACK. Less than the original option and less than the amount paid for land on a better site to the same people by the city of New York.

Mr. SHERLEY. You are asking now for an additional $100,000?

Col. WINSLOW. Of this $100,000, $80,000 covers fortification sites in the Boston Harbor, and $20,000 other sites on the shores of Delaware Bay.

Mr. SHERLEY. Have you any knowledge as to whether this amount of money will be necessary to purchase these respective sites?

Col. WINSLOW. For the sites in Boston Harbor the estimates are those of the district officer, made after consulting real estate men and looking at the assessed valuations. But the owners have not as yet been approached, so we can not say positively that the purchases can be made for that amount of money.

Mr. **Sherley.** What about the Delaware Bay?

Col. **Winslow.** For Delaware Bay our figures are based on an acreage value.

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Col. **Winslow.** Before we resume, Mr. Sherley, I would like to mention one thing with regard to the searchlights. Among the other advantages of the new Sperry searchlight is the fact that they have a new device for occulting the carbon at the moment the current is turned off, so we do not have the glow from the carbon as it cools slowly. It becomes instantly dark.

Gen. **Weaver.** That makes it unnecessary to use a shutter.

Col. **Winslow.** Yes; they have a little cap which covers the carbon and stops the glow at once.

SAN DIEGO.

(See pp. 8, 100.)

CONSTRUCTION OF ROADS, TRAILS, WATER AND SEWER SYSTEMS, ETC.—SEACOAST FORTIFICATIONS.

Mr. **Sherley.** Colonel, the next item is "For the construction of roads, trails, water and sewer systems, etc., for the service of seacoast fortifications, $40,000." Is this a new item?

Col. **Winslow.** This is a new item and relates entirely to the defenses of San Diego Harbor, Cal. It is the subject about which Gen. Black made a few remarks on Saturday.

Mr. **Sherley.** Suppose you state somewhat in detail the purpose

Col. **Winslow.** One of the new batteries which has been constructed at San Diego is on what is known as the naval reservation—land once set aside for naval purposes but now transferred back to the Army. The battery is in a hollow, and the only means of communication between it and the older post, where the barracks are, i to go up a long, steep hill to the top of the ridge, then go about hal a mile along the top of the ridge, where any person moving is silhouetted against the sky, and then go down into the battery. A par of these funds is to build a road from the barracks directly to th battery. Then, in addition, it covers building a trail out to new searchlight and fire-control stations, and provides also for disposal o the sewage from the new battery.

Mr. **Sherley.** What will each of those particular purposes cost?

Col. **Winslow.** Ordinarily these items are covered by the Quartermaster Department's estimate, but at the special request of the commanding general of the Western Department and upon the recommendation of the Chief of Coast Artillery they were included i the Engineer Department's estimates.

Mr. **Sherley.** Why should an exception be made to the gener rule?

Col. **Winslow.** It was considered that the Engineer Departmen was in better position to do the work in that particular locality tha the Quartermaster Department, as we had our plant and organizatio there. It consists of about $16,000 for the road, $1,500 for the trail about $18,000 for water mains and pipes, and about $4,000 for sewers, and then a slight remainder for incidentals, making a total of $40,000.

Mr. SHERLEY. Why should not the money still be obtained by the Quartermaster's Department and, if need be, the work turned over to you gentlemen?

Col. WINSLOW. The line of demarkation between the Quartermaster work and the Engineer Department work in the vicinity of batteries has been a very indefinite one, and has changed from time to time. The general rule is that the Quartermaster brings the water mains up to within about 100 yards or so of the batteries and builds the sewers to within about that distance from the batteries. The Engineer Department, in connection with battery construction, connects the batteries with these water mains and sewers in the same way as a city lays the mains and sewers in the streets and the property owners have to connect their houses to those mains and sewers. Then, ordinarily, on the posts the Quartermaster Department builds the roads. If the batteries are quite a distance from any road system, the Engineer Department has to build the roads for construction purposes, and afterwards turns them over to the Quartermaster Department. In the same way, if there is a railroad used for construction purposes, the Engineer Department builds the railroad in connection with its construction work and then turns it over to the Quartermaster Department to maintain and operate, provided this is considered necessary. Otherwise the material is taken up and used elsewhere.

Mr. SHERLEY. Why should we allow this sum? Will we not practically be creating a new item and in the future be met with constant requests for funds which heretofore have been supplied out of the allotment to the Quartermaster?

Col. WINSLOW. Before this matter was submitted as an estimate the papers in the case passed through the Quartermaster Department, and the Quartermaster General expressed himself as perfectly willing in this case that this matter should be handled in this manner.

Mr. SHERLEY. Oh, of course. All he can get done in the way of special things by specific appropriations leaves his general fund that much larger for other matters; but that is just the point: whether we ought to create a new item in this bill. How urgent is this work?

Col. WINSLOW. It has to be done by somebody.

Mr. SHERLEY. But when?

Col. WINSLOW. It ought to be done in the very near future, because the battery is now practically completed, as you saw by the photographs Saturday.

Mr. SHERLEY. What are they doing, or what will they do in the way of road building at this fortification?

Col. WINSLOW. The Quartermaster Department was asked to do this work and stated that there were no funds available at the time; and then the question came up about including the item in the estimates for 1918, and the question was as to which department should submit the estimates, and the Secretary of War ordered us to submit it.

Mr. SHERLEY. Is there any other work they have got to do there?

Col. WINSLOW. I could not say as to that.

Gen. WEAVER. I do not know of any.

CONSTRUCTION OF SEACOAST BATTERIES—HAWAIIAN ISLANDS.

Mr. **Sherley**. Colonel, the next item is "For construction of seacoast batteries in the Hawaiian Islands, $1,040,000." Will you explain the reason for this?

Col. **Winslow**. That is to cover the emplacement of the six long-range 12-inch guns of the Board of Review's project for the Hawaiian Islands. They are located at different places on the islands.

Mr. **Sherley**. As I understand, Colonel, this estimate is for the cost of the emplacements for six 12-inch guns mounted for high-angle fire?

Col. **Winslow**. That is correct.

Mr. **Sherley**. Will each emplacement cost one-sixth of the total, or do they vary?

Col. **Winslow**. They vary considerably, depending upon the location.

Mr. **Sherley**. Can you give an idea as to the cost of the different emplacements?

Col. **Winslow**. One battery of two guns will cost about $320,000, another about $380,000, and the other about $340,000.

Mr. **Sherley**. That is due to the topography of the land?

Col. **Winslow**. That is due to the topography and whether or not we can take advantage of neighboring accidents of the ground to conceal and protect the battery.

Mr. **Sherley**. What character of emplacements are you undertaking to make? Do they vary materially from the ordinary emplacements for 12-inch guns?

Col. **Winslow**. Not materially from the plans for the same guns in this country.

Mr. **Sherley**. We have had a number of proposals touching additional armament for the Hawaiian Islands. This present program is the result of what decision, by what board, and when?

Col. **Winslow**. By the War Department Board of Review during the last six months or so. Over a year ago they decided upon this program, and since that time there have been several proposals made by various officers who have studied the subject for modifications in the program, for increases in the number of guns, or for changing one character of gun for another, and so on. All these papers were referred to the Board of Review, but during the past summer the Board of Review decided to adhere to its former program covering these particular guns for which estimates are now submitted. This decision was approved by the Secretary of War.

Mr. **Sherley**. When the Board of Review's program, which contemplated the spending of some $96,000,000, was submitted did it embrace those particular guns?

Col. **Winslow**. That is my understanding.

Maj. **Embick**. Yes, sir.

Mr. **Sherley**. There was no change in the number of guns?

Maj. **Embick**. No, sir.

Mr. **Sherley**. The discussion has simply been as to the character of the guns and the places where they should be emplaced?

Col. **Winslow**. Yes, sir; as to the places where they should be emplaced. At first decision was made as to tentative locations, and those locations were studied by officers on the ground and criticized in one way or another. One battery, which we call Battery A, it was decided to move some miles farther north; one battery, which we call Battery B, it was decided to move a few hundred yards to the left, so as to take advantage of temporary accidents of ground, and of the third battery, known as Battery C, the exact location is still under discussion.

Mr. **Sherley.** As I recall, the purpose to be accomplished by the mounting of those guns was to so cover all of the coast line of the island as to prevent any ship from standing in close enough to cover with its small guns landing parties.

Col. **Winslow.** That is the idea.

Mr. **Sherley.** That idea is still the one which is the basis of this proposal.

Col. **Winslow.** It is.

Mr. **Sherley.** At the same time, there was a plan considered for the land defense of the island. Is this in accord with that program, and has that program been practically agreed upon?

Col. **Winslow.** This is a part of that program and is connected with that program—that is, the two programs—the one for these guns and the program for the land-defense work in together.

Mr. **Sherley.** Has that been finally approved, or have the details of the land defense been finally approved by the Board of Review?

Col. **Winslow.** Some modifications are expected in the future, especially with regard to the location of the strategic roads, a subject which will come up under the land-defense program.

Mr. **Sherley.** Are these properly to be designated as seacoast batteries?

Col. **Winslow.** They are seacoast batteries, because they are intended to fire at vessels off the shore and incidentally to prevent landing parties.

Mr. **Sherley.** Are they to have an all-round fire?

Col. **Winslow.** Yes, sir.

Mr. **Sherley.** They can be used, also, in land defense against mobile troops?

Col. **Winslow.** Whenever they come within range.

Mr. **Sherley.** I was going to say that their range is supposed to be something like 30,000 yards——

Col. **Winslow.** Thirty thousand yards.

Mr. **Sherley.** With light projectiles?

Col. **Winslow.** Yes, sir.

Mr. **Sherley.** And that would make the arc of any one of them pretty nearly cover the entire area?

Col. **Winslow.** I think practically the entire island is covered by them.

Maj. **Embrick.** They overlap.

PHILIPPINE ISLANDS.

(See p. 57.)

Mr. **Sherley.** You spoke awhile ago informally of the fact that there was embraced within the Board of Review's program for the Philippines a scheme for the mounting of a couple of 12-inch guns of high-angle fire in connection with the land defenses there, and you stated that the estimates for that were not submitted, due to the fact of some proposed change in the character of the overhead protection.

Now, does the committee understand that in the event a final determination is had as to the character of the emplacements desired. you would want to begin work some time this summer upon those emplacements?

Col. WINSLOW. We would like to be able to begin work this coming summer on the emplacements on Corregidor Island. The estimates for these implacements were not submitted for the following reasons: As soon as it was decided to mount guns of this character on Corregidor Island the district engineer officer was notified of the fact, was given typical plans, and was directed to submit detailed plans and detailed estimates of cost. These were received, but the plans were not thoroughly satisfactory and it seemed impossible to determine in Washington exactly what the estimates of cost for modified plans would be; and, as the law states that no estimate for engineer structures shall be submitted except when based upon plans, we could not submit legal estimates. The plans were criticized and sent back to the district officer for modification, and it is expected that that matter will be entirely settled before long.

Mr. SHERLEY. Roughly, about what would the emplacements for each of those guns on Corregidor cost?

Col. WINSLOW. Probably somewhere between $200,000 and $250,000.

Mr. SHERLEY. If it was desired to begin work on them this summer and, therefore, desirable to carry an appropriation for it in this bill, about what sum of money do you think would be sufficient to enable you to start that work and continue it until funds would be available in the next fortifications bill?

Col. WINSLOW. I think from $240,000 to $250,000.

Mr. SHERLEY. I gathered, also, from your informal statement in connection with these guns in the Hawaiian Islands that as to two of them there was some discussion being had as to the location of the emplacements, and that, in consequence, you might be delayed in starting that work.

Col. WINSLOW. It is not improbable that there will be some delay, and the estimate could be reduced——

Mr. SHERLEY (interposing). Assuming that the committee wanted to allow this item, if provision was made for something like $250,000 for the Philippines and a corresponding reduction was made in the item for the Hawaiian Islands, the Engineer Department would understand that that was an indication of a determination on the part of Congress to have the two pieces of work go on as soon as it was practicable?

Col. WINSLOW. Yes, sir.

Mr. SHERLEY. Colonel, is this $1,040,000 your total cost of the emplacements for those guns in the Hawaiian Islands, according to the plans——

Col. WINSLOW (interposing). According to the present plans.

Mr. SHERLEY. Does this clean up finally all of your proposals for the Hawaiian Islands in the way of seacoast defenses?

Col. WINSLOW. It cleans it all up, according to the present project.

Mr. SHERLEY. I know; but have you reached a point where there is a final decision, or are we going to be met again with an additional program?

Col. WINSLOW. That is a question for the War Department and the Board of Review to answer, and I think that the Chief of Coast

Artillery, as a prominent member of that board, can answer that question better than I.

Mr. **Sherley**. General, the question is this: We have thought from time to time that we had reached the end of the program for the Hawaiian Islands, only to find out that a new proposal was submitted to us; now, are we at the end of those proposals?

Gen. **Weaver**. Mr. Chairman, I think it can be said that we are at the end of one horizon—that is, so far as our mental vision carries at the present time, it is the end.

Mr. **Sherley**. Let me put the question in a different form: With the mounting of these guns and the carrying out of the existing program by the building of roads and trails in connection with the land defense of the Hawaiian Islands, will we, according to the final or present conclusions of those highest in authority, have fully and adequately provided for the defense of the island of Oahu?

Gen. **Weaver**. It is my understanding that according to present views you will have provided adequately for the defense of that island in so far as fixed armament is concerned.

Mr. **Sherley**. What is your judgment on the question of whether or not there will be any need for additional fortifications there?

Gen. **Weaver**. Personally I do not know of any need for additional seacoast fortifications there until the present armament becomes obsolete.

PROTECTION, PRESERVATION, AND REPAIR OF FORTIFICATIONS IN HAWAIIAN ISLANDS.

Mr. **Sherley**. The next item is, "For protection, preservation, and repair of fortifications, for which there may be no special appropriation available, and for maintaining channels for access to torpedo wharves, at the following localities: In the Hawaiian Islands, $12,500." I notice in this item a change of language. You are dropping out the words, "including structures erected for torpedo defense," and you are inserting the words, "for which there may be no special appropriation available."

Col. **Winslow**. That is in order to make the items for the insular possessions read exactly in the same way as the corresponding item on page 18 for the United States. This applies to the words proposed to be inserted. The words "including structures erected for torpedo defense," are left out because that is really a part of the fortifications. Formerly it was covered by a special appropriation, but for the last two years there has been no special appropriation, and the maintenance of torpedo stations has been included in the regular work under the appropriation for protection, preservation, and repair.

Mr. **Sherley**. You are asking $12,500. Last year you asked $5,000 and received it. What is the condition of your balances?

Col. **Winslow**. The available balance on October 31 was $3,730. Last year the appropriation which had been made ran out early in the year—in March or April—and the coast defense commander of the coast defenses of Oahu submitted a letter from which I would like to read an extract, as follows:

> The inability of the Engineer Department to fill coast defense requisitions to attend to urgent repairs and improvements owing to lack of funds has

reached the point where the proper maintenance and operation of important elements of the coast defense are rendered impossible. The allotments for maintenance of fortifications and for electrical and other supplies have been insufficient for the last two years. As new elements have been turned over and repairs to older elements have become necessary, the absence of funds has imposed a continually increasing hardship.

This item of $12,500 is based upon estimates submitted by the local officer. His estimates for general maintenance of fortifications is $7,843; for the general maintenance of torpedo structures, $1,300; for repairing the slopes of battery Hasbrouck, $1,200; for resodding the slopes of battery Hasbrouck, $1,000; for resodding the slopes of battery Selfridge, $700; and for resodding the slopes of battery Jackson, $500. Then special items amount to $3,400. The total of all the items I have read figures up to $12,543, but we have made a lump-sum estimate of $12,500.

Mr. SHERLEY. You started out in 1913 with $500; then in 1914 we gave you $1,000; in 1915, $3,000; and in 1916, $3,000. Then, because of your piteous appeal to us last year, as the result of a communication received from the district officer, we gave you $5,000. We thought we were pretty liberal, but now you are jumping 150 per cent and ask for $12,500. Does it not strike you that that is a good deal of money for this purpose?

Col. WINSLOW. It is quite an increase, but from the evidence we have in the case——

Mr. SHERLEY (interposing). But that letter was written when we gave you the $5,000 last year.

Col. WINSLOW. You gave us $5,000, and a fourth of that brought us through the first quarter of the year, but experience has shown that there is more work in connection with the maintenance of fortifications in the spring, for the reason that during the wintertime, or during the season that corresponds to our winter, they have at Honolulu the kona storms, and then there occurs about the only rainfall they have on this coast. At Fort Kamehameha, for instance, the chances are that from the 1st of March to the 1st of December there will probably not be more than a few inches of rainfall. Then, during the wintertime, some time in these four months, the rainfall may be very heavy. Last year they had very heavy rainfalls, which injured the slopes of the batteries, which were comparatively new. The special items which I stated are for the repair of that damage.

Mr. SHERLEY. Those special items reach only $3,000.

Col. WINSLOW. They amount to $3,400.

Mr. SHERLEY. They amount to only $3,400, and there is an item of $4,000 additional that you are asking as a general maintenance item.

Col. WINSLOW. For general maintenance we estimated $7,800. That is based on information we got from the local officer.

Mr. SHERLEY. That is proportionately very much more money than we allow for that purpose in the United States.

Col. WINSLOW. The appropriations for the United States have been all right; but year after year for the last three or four years they have proved to be insufficient for the work in Hawaii.

PROTECTION, PRESERVATION, AND REPAIR OF FORTIFICATIONS IN PHILIPPINE ISLANDS.

(See p. 54.)

Mr. **Sherley**. In the Philippine Islands, for the same purpose, you are asking $25,000. Last year we gave you $10,000, the year before $4,000, and the year before that $1,000, because we found that you were piling up balances that you could not spend. How are you getting along with the $10,000 this year?

Col. **Winslow**. On September 30 they had just begun on the $10,000 appropriation. At that time they had just used up the old balances. The district officer in the Philippine Islands in September submitted by cable an estimate for $57,000; but he was informed that this estimate was so much more than anything that they had ever had before that the Chief of Engineers did not feel justified in submitting an estimate of that character to Congress, so the Chief of Engineers cut it down to $25,000. We have had several letters on the subject. The details of that estimate are $6,000 for repairs to roads and trails——

Mr. **Sherley** (interposing). Have you built any roads and trails out there in connection with the fortifications?

Col. **Winslow**. Yes, sir; a good many of them all over the islands.

Mr. **Sherley**. You only got those land-defense items last year——

Maj. **Embick** (interposing). The first appropriation was about 1911.

Col. **Winslow**. There was one made a long time ago, and then there was a long delay. The next item is $7,810 for concealing batteries at Fort Mills, Fort Frank, and Fort Hughes, on Corregidor Island——

Mr. **Sherley** (interposing). That is not a preservation item.

Col. **Winslow**. It is largely for painting the slopes, so as to make them accord with the background. Then there is an estimate of $15,000 for miscellaneous repairs and preservation. In addition, there are several small items, also one for $5,000 for supervision expenses at Fort Mills. The work on those islands has been going on, up to this time, in connection with the construction work, so that the office force, including superintendence, has been charged to the construction work. But the construction work is about completed now everywhere, except at Fort Drum, and that will be completed within a year, and for that reason all of the supervision cost must hereafter be charged to the regular maintenance and upkeep fund.

Mr. **Sherley**. In the meantime those batteries have gone into commission?

Col. **Winslow**. Yes, sir.

Mr. **Sherley**. You have a good many soldiers out there, not only in the Coast Artillery but you have other soldiers there.

Col. **Winslow**. Yes, sir.

Mr. **Sherley**. What is the reason you can not employ them in keeping the trails clear? That is one of the first things that the soldier has to do in actual warfare—to learn to use the pick and shovel.

Col. **Winslow**. They are used to some extent.

Mr. **Sherley**. With all of the men you have got over there, why can they not keep those trails open?

Col. **Winslow**. That is a question I can not answer.

Gen. **Weaver**. Is this for keeping open the trails?

Mr. **Sherley**. They have an estimate of $6,000 there for keeping the trails open.

Col. **Winslow**. I will read some extracts from this letter of the district officer:

> The following information is furnished regarding the requirements for the maintenance of land-defense roads and trails at Fort Mills, Corregidor Island:
>
> It may be pertinent to remark that the word "trails" is somewhat a misnomer, since nearly all of them are narrow roads, practicable for field and siege guns. The "trails" are in reality unsurfaced roads, which require considerable work of maintenance and protection from damage by water. All these roads and trails connect with important features of the land-defense system, and must be kept in good passable condition at all times.
>
> The estimated cost of maintenance of the roads and trails was based on experience had in maintaining some of them during the past few years. The apparently high unit cost is due to the peculiar topographical conditions on Corregidor Island.
>
> About 85 per cent of the roads and trails are on side hills, the slopes of which in many cases are not less than 45°. The material of these slopes is generally unstable, consisting of clay, friable volcanic tufa and rotten rock. During the typhoon season the rainfall is very heavy and the rate of precipitation excessive. In many cases the slopes are also exposed to wave action during storms. As the result of these conditions slides and washout of considerable magnitude are of frequent occurrence and portions of the roads have to be rebuilt at the typhoon season. During the rainy season the work of clearing ditches, gutters, and culverts must be carried on continuously to prevent minor washouts.
>
> Some of the roads in the system carry heavy traffic and require frequent resurfacing. The stone available for this purpose is soft and of an inferior quality. The stone used can be obtained in only one part of the island and must be hauled by wagons over steep roads. For a large proportion of the resurfacing work the teams can make only two or three trips per day on account of the distance and grades.

Mr. **Sherley**. You were speaking of the roads being traveled—why is not that the quartermaster's job?

Col. **Winslow**. These roads connect the fortifications.

Mr. **Sherley**. I understand, but these are roads that the quartermaster department's people use.

Col. **Winslow**. They are really used as a connection to the batteries for the traffic that goes back and forth to and from the batteries.

Mr. **Sherley**. What traffic do you have between the batteries in the way of wagons?

Col. **Winslow**. They carry the ammunition to the batteries. That is the only way for getting ammunition to the batteries for target practice, and that ammunition is heavy.

Mr. **Sherley**. But most of this ammunition is supposed to be right at the battery.

Col. **Winslow**. I know, but they have to get fresh supplies each year for target practice. They maintain at each battery a certain amount of ammunition of all kinds, and when it is shot away in target practice it has to be replaced. Now, I was going on to say these estimates as submitted were considered by the Chief of Engineers and he arbitrarily cut them down to less than one-half. All the other information with regard to these trails and the reasons for them is given here.

LAND DEFENSES, HAWAIIAN ISLANDS.

Mr. SHERLEY. The next item is, "For land defenses in the Hawaiian Islands, including the construction and repair of roads required for military purposes, the procurement and installation of searchlights, and the acquisition of land and rights of way, $225,000." I notice that you have put in some new language, "the construction and repair of roads required for military purposes." Why is that language inserted?

Gen. BLACK. The adoption of the policy of endeavoring to prevent an enemy from obtaining a foothold on the Island of Oahu was necessitated by the fact that unless he be prevented from landing on the island and advancing into the island it was next to impossible to prevent the destruction of our naval base at Pearl Harbor, due to the peculiarities of its location. It is also very good strategy to hinder an enemy at the point where he is having the most difficulty. That, invariably, in the case of the occupation of an island, is at the landings. So that last year the necessity for the construction of a system of strategic roads, which will lead from the point of concentration of our forces to the points on the island which are likely to be used as landing places by the enemy, was adopted as a definite part of the land-defense scheme and, I might say, it is by long odds the most expensive part of the scheme. I have forgotten the exact length of the shores of the entire island, but it is very considerable. There are landing places on all coasts—north, south, east, and west—where expeditionary forces can be landed.

It is manifestly impossible to have enough troops there to be able to oppose landing forces at all of these places at the same time. The enemy will choose his landing place. Therefore, the proper military scheme requires that we have concentrated at convenient points on the island bodies of troops sufficiently large to meet him wherever he lands, and that we be able to move the troops to whatever landing place he selects, no matter where it is, the only dispersal of troops being those necessary for patrol duty and pickets to give warning that an expedition is threatening to land. At present the development of roads on the island for commercial purposes is not a part of this scheme. Take the east side of the island as an example. From the Great Central Valley, in which are the Pearl Harbor and Schofield Barracks, there is a road that runs around the southeast corner of Oahu, crossing the mountain ridge by what is termed the old King's Trail, which at one time, many years ago, was evidently a practicable roadway, used by the Hawaiians in their movements. That trail has now deteriorated so that it is extremely difficult to go across that way, but once you get down across the island there is again a series of roads running along the beach, along the coast, connecting the different plantations along the coast.

Again, halfway up on the east coast there is a practicable pass across the islands which can be used to-day as a trail for men on foot and men on horseback, but across which artillery of greater caliber than the mountain guns can not be taken. The only other means of access to the east side of the island is by a road that leads from the Central Valley to the north, and then by a partially constructed road running around the north edge. These coastal roads are all plainly visible from the sea and entirely under the guns of any ship that may be out there. They are therefore not available as means for the passage of large bodies of troops for any great distance along the shore. as they would be exposed to the enemy. Now, the plan is to take Schofield Barracks as a center and to build a series of roads through these passes out to the seashore, and then, along with that, shorter pieces of road, so that the available landing places can be reached in the shortest possible time. It is proposed not to make these roads highly improved macadam roads, but simply roads sufficiently good to enable the rapid transportation of cavalry and field artillery, including the heaviest of our mobile siege guns, and with a surface sufficiently strong to stand the wear caused by the tropical rainstorms on steep slopes around the mountains. Those roads will be constructed with that in view. Some of these roads will be very important commercially; some of them are, in fact developed commercially, and the Government of Hawaii offers to give to the United States rights of way over all the roads that they have and those which are to be commercially developed, and they offer to maintain some of the others; therefore this language is put in the bill to show that the object of this construction is for military roads for military purposes.

Mr. SHERLEY. You spoke of the government of Hawaii being prepared to give you rights of way and to maintain roads which have a commercial value?

Gen. BLACK. Yes, sir.

Mr. SHERLEY. What form is that in?

Gen. BLACK. As I recollect, it is contained in a formal letter from the road authorities of the island, or from some of the authorities there, addressed to the commanding general there.

Col. WINSLOW. It is contained in a communication to the commanding general of Hawaii from the Territorial government.

Mr. SHERLEY. Is it in such form as to bind the Territorial government?

Gen. BLACK. I presume as far as it can be bound.

Mr. SHERLEY. In explaining the reason for this language you have gone into the general proposal. You are asking $225,000. Last year it was testified, as I recall, that the year before the entire project, as it then existed, needed only $69,000 more for its completion, and that last year's estimates, therefore, showed an increase of $60,000, and that if the total amount were given it would complete the project. Then, subsequently, I think either by supplemental estimate or in some way, $40,000 was added, so that, although the estimate last year was only $129,000, the appropriation made was $169,000, which the committee was under the impression completed the entire program for the land defenses, other than the mounting of these guns. Now we are met with the proposition of an estimate for $225,000.

Gen. BLACK. Yes, sir; and more will be asked.

Mr. SHERLEY. The $40,000 additional was asked, as I recall, for supplies that should be on hand there, in the nature of barbed-wire entanglements, etc.

Col. WINSLOW. "Obstacles in the rear of batteries," is the wording.

Mr. SHERLEY. And now, General, you are asking for $225,000, and this represents a part of what total sum?

Gen. BLACK. It is hard to say how much money can and should be spent for these roads. There was a rough estimate made of

$1,000,000 for roads in Hawaii. I have tried my best for three or four months to get detailed estimates for certain roads, but I have not gotten them. I obtained from my assistant out there an estimate of $25,000 a mile for all of those roads, which I know to be wrong. I built roads under conditions of that kind in Cuba, and a good many of them. I know that there are parts of those roads which will cost $25,000 per mile, but I also know that there are other parts which will cost no more than $3,000 a mile. Therefore I was quite unwilling to present to you any project for roads out there at $25,000 a mile, because I know it is not going to cost that much for all of them, although I know it is going to cost that much for some of them, and I know that very well. However, I have not been able as yet to get any detailed project for those roads.

Gen. Strong cabled me a short time ago asking me if I could not come directly to Hawaii, I suppose on matters connected with this project as well as some other matters connected with the land-defense scheme. I consulted the Secretary of War, and he told me to cable him that I would not be able to get out there before the spring, because I had to be here and attend these hearings. So I can not answer your question as closely as I would like to answer it.

Mr. Sherley. General, I understand from you that the cost of building the roads that may be determined necessary in connection with the land defense has not been arrived at?

Gen. Black. It has not.

Mr. Sherley. Nor has there been arrived at what roads are necessary to be built?

Gen. Black. That is true, sir.

Mr. Sherley. Is it true that any roads have been determined on?

Gen. Black. Yes, sir; we know that we must complete the "old King's Highway." There are two sections of it which are to-day impassable, or practically so; one of them lies on the south coast, between Diamond Head and Koko Crater; another portion is the portion that goes down over the mountain wall itself in the neighborhood of Makapun Point. We know that must be done.

Mr. Sherley. Do you know what that will cost?

Gen. Black. Not in detail.

Mr. Sherley. Do you not think while you are determining that, as well as elaborating your scheme, you can afford to await the appropriation of the money?

Gen. Black. No, sir; I do not.

Col. Winslow. This estimate includes $10,000 for survey to locate the strategic roads and $100,000 for the repair and reconstruction of the road around Makapun Point, to which the general has just referred.

Mr. Sherley. What is the other $115,000 for?

Col. Winslow. The other $115,000 covers the increases in the other sections of the land-defense project which I will give you in detail; $7,800 for the increased cost of trenches, etc., on Red Hill and for the roads behind them. This is due to the fact that they found the material was much more difficult to excavate than had been expected. Eleven thousand eight hundred dollars for the repairs of the old portable searchlights. These are searchlights which were bought in this country for experimental purposes and were sent out to the Hawaiian Islands because they were portable. It is now desired to repair them by putting in them high-efficiency lights. Then $1,000 has been asked for for hydrographic surveys, to determine at exactly what points the enemy might be able to land and at what points they could not. Then $34,600 includes the fire-control system, so as to make the mortar batteries on the islands available for land defense. The mortar batteries now on the islands were built for seacoast defense. Their fire-control system was intended only for the observation of fire at vessels. It is now proposed to use these guns for land defense purposes, and that requires additional base and stations and additional communications. Then $40,000 for a reserve magazine, which it is expected to build to hold the reserve ammunition for all the land-defense and other guns. Those guns all have magazines near them, but those magazines, for economical reasons and to keep them as inconspicuous as possible, were made only large enough for a day or two's supply of ammunition, and it is considered desirable to have a central magazine which will hold all the rest of it. Some of this ammunition has been stored in the lower stories of the motar battery at Diamond Head, but that space is now needed for its proper purpose in connection with the battery there, and the reserve magazine is needed.

Mr. **Sherley**. Have the locations of the fire-control stations been determined upon?

Col. **Winslow**. They have been determined upon, and we have made the detailed drawings and estimates.

Mr. **Sherley**. I hope they will be a little less conspicuous than some of the existing ones.

Gen. **Black**. We are doing everything we can to make that true.

Col. **Winslow**. There is one other point I would like to say in this connection. The actual expenditure of money has gone on a little more slowly than we expected, and if that amount of $225,000 is cut down to $110,000, that is to the item for roads, and the wording is changed so as to cover the roads, we will have sufficient funds for the next year, or until another bill can be passed.

Mr. **Sherley**. What is the condition of your funds now?

Col. **Winslow**. $186,000 is the free balance.

Mr. **Sherley**. You gentlemen are presenting a considerably new scheme and one that Congress might hesitate to enter upon unless it knew the extent of it.

How much road do you contemplate you can build for this $100,000, and have you any estimates that guide you in the matter?

Col. **Winslow**. This $100,000 is intended for the construction of a portion, and the repair of the rest, of a road about 20 miles long. Part of it is now in fair condition, part of it is in poor condition, and part of it is in an impassable condition.

Mr. **Sherley**. If that road was built, how important would it be in the absence of the building of other roads that are contemplated in this general scheme which has been outlined by Gen. Black?

Col. **Winslow**. It would probably complete the system of strategic roads on the extreme southeastern corner of the island—from the southeast corner up to an existing pass over the mountains, where there is a fine road maintained by the Territory for tourists and commercial purposes.

MAINTENANCE AND REPAIR OF SEARCHLIGHTS, ELECTRIC LIGHT AND POWER PLANTS, HAWAIIAN ISLANDS.

Mr. **Sherley** (reading):

For the maintenance and repair of searchlights and electric light and power equipment for seacoast fortifications, and for tools, electrical and other supplies, and appliances to be used in their operation at the following localities:

In the Hawaiian Islands, $2,500.

Last year you asked for $2,500, and we gave you that amount. How are you getting along?

Col. **Winslow**. On the 30th of October there was $1,066 left, and that is all; in other words, during the four months of the year they had spent practically $1,500 and we had for the remaining eight months only $1,000.

Mr. **Sherley**. Evidently they think it is enough, because they are not asking any more this year.

Col. **Winslow**. They asked for more, but we cut it down before we got all the information from them. In this connection I would like to state that the same remarks which I read from the commanding general of the coast defenses of Oahu with reference to preservation and repair apply to this item.

MAINTENANCE AND REPAIR OF SEARCHLIGHTS, ELECTRIC LIGHT AND POWER EQUIPMENT, ETC., PHILIPPINE ISLANDS.

Mr. **Sherley**. In the Philippine Islands you are asking for $5,000. Last year you asked for $4,000 and you got $3,500. How did you get along year before last, when you had $3,000?

Col. **Winslow**. Last year the officer out there was very saving, and he did not quite spend all the money during the fiscal year, but has recently started on it; that is, in September he started on the new appropriation of $3,500.

The reason for the increase is that there have been just installed—that is, within the last month or so—and are now about to be turned over to the Coast Artillery, all the electric plant on El Fraile Island, which consists of seven 150-kilowatt Deisel oil engines. In addition, there are a few other generating plants on the other islands of the bay about to be turned over, so that the actual amount of machinery to be kept up and maintained hereafter and to be provided with supplies is now some 60 per cent or 75 per cent greater than it has been. That is the reason for increasing the estimate.

CONSTRUCTION OF SEA WALLS AND EMBANKMENTS.

HAWAIIAN ISLANDS.

Mr. **Sherley**. The next item is, "For construction of sea walls and embankments, Hawaiian Islands, $10,500." For 1916 you had $21,000. Did you spend all of that on that particular piece of work?

Col. **Winslow**. In connection with that work, the sea wall itself has been completed, and there is a balance of but $394.43. During the construction of the sea wall, some ground behind it was washed out by a storm and the location of the sea wall was changed somewhat so as to include behind it 18,400 square feet more than there was before intended. This estimate is submitted for filling the area behind the wall by pumping in material.

Mr. **Sherley.** That sea wall was along Waikiki Beach?

Col. **Winslow.** Yes, sir; in front of Fort De Russy, on Waikiki Beach. A portion of the reservation when purchased had a sea wall about 350 feet; next there was a section where a sea wall had formerly been built, but which had be undermined. The remainder of the front never had a sea wall.

Mr. **Sherley.** Is this to build any additional sea wall?

Col. **Winslow.** No, sir; this is to fill in behind the existing wall.

Mr. **Sherley.** And not to build any more sea wall?

Col. **Winslow.** No, sir; the sea wall has been built, and this is to fill in behind it.

Mr. **Sherley.** Is there a detailed estimate of the cost?

Col. **Winslow.** Twenty-six thousand three hundred and forty-three cubic yards of material are to be put in.

Mr. **Sherley.** At how much per yard?

Col. **Winslow.** About 40 cents per yard.

Mr. **Sherley.** Is that low?

Col. **Winslow.** That is quite low. The only filling that has been done in the same place was in the way of filling some duck ponds farther back from the shore and requiring 600 feet longer discharge. The cost of this was 43 cents per yard. So the estimate of 40 cents per yard for this new work is evidently not excessive.

FOR FILLING PORTIONS OF FORT DE RUSSY RESERVATION, HAWAIIAN ISLANDS.

Mr. **Sherley.** The next item is, "For filling portions of Fort De Russy Reservation, Hawaiian Islands, $54,000." What is the purpose of this?

Col. **Winslow.** This is for filling in the remainder of the duck ponds in the rear part of Fort De Russy. This fort consists of a strip about 400 or 500 feet wide along the shore where the ground is high and solid and of an area farther back where there was formerly a series of duck ponds, some of them as large as 10 acres in extent and others that were smaller. In 1910 and 1911, from an appropriation made for the purpose, about one-half of the area of duck ponds on the reservation was filled. That was done at that time for hygienic purposes. The ponds that were filled were on the windward side of the post, so that all of the mosquitoes that came out of those duck ponds were blown to the post. When the ponds were filled, the number of mosquitoes at the post decreased enormously. There were some other ponds, however, that were not filled, because the funds at the time were not sufficient. It is now proposed to fill the remaining ponds. They consist of 1,118,000 square feet of area, and require the placing of 134,642 cubic yards of fill at a cost of 40 cents per cubic yard.

Mr. **Sherley.** Are there many duck ponds right near there off the reservation?

Col. **Winslow.** There are some duck ponds a little distance from the reservation, at the other side of Kalakaua Avenue.

Mr. **Sherley.** Just across?

Col. **Winslow.** Yes, sir; just across. I suppose there are 1,000 or 1,500 acres of ponds.

Mr. **Sherley.** Are you going to get any particular relief, then, by filling these ponds while those are still there?

Col. **Winslow.** This new filling is not required as much for sanitary purposes now as in order to make the area available for post buildings and other purposes at the post.

Mr. **Sherley.** What do you need them for? Have you not all the barracks and quarters there now that you need?

Col. **Winslow.** No, sir. This is a part of the post where there are to be stables and some buildings for the Signal Corps.

Mr. **Sherley.** Why should not that be a part of the work to be done at the time the appropriation is made for those buildings?

Col. **Winslow.** I will also say with regard to this item that it is another item which we were directed to place in the estimates of the Engineer Department. The proposals to do this did not originate with us. It is one that is ordinarily covered by the Quartermaster's Department estimates, but this year we were directed to include it in our estimates.

INSTALLATION AND IMPROVEMENT OF MEANS OF ACCESS TO THE DEFENSIVE WORKS AT FORT RUGER, HAWAIIAN ISLANDS.

Mr. **Sherley.** The next item is "For installation and improvement of means of access to the defensive works at Fort Ruger, defenses of the Hawaiian Islands, $40,000."

Col. **Winslow.** This item was intended to include the enlargement f the existing tunnel through the rim of Diamond Head crater, the ining of this tunnel, as enlarged, with concrete, and the construction of a railroad through it into the crater.

Mr. **Sherley.** What is the reason for that?

Col. **Winslow.** The principal object of this was in order to get the materials for the construction of 12-inch long-range battery hich it is expected to build into the crater, and later to get the guns and carriages through. It is now proposed that the battery ill not be located in the crater, and I understand that the Chief of oast Artillery is in favor of cutting out this item.

Mr. **Sherley.** This tunnel was originally built simply as a contruction matter incident to the work.

Col. **Winslow.** Yes, sir; and it was of comparatively cheap contruction.

Mr. **Sherley.** Why is it not big enough, even in the event 12-ich guns were put in there, to enable you to carry the material rough?

Col. **Winslow.** The tunnel was built because it was figured that t would cost less to build that tunnel and carry the materials rough than it would be to carry them over the hill. The tunnel t about $5,800. When it came to the construction of a very large ttery inside, and to getting the guns and carriages in, and later or the ammunition, it was thought it would be advantageous to crease the size of the tunnel. The estimate came from the waiian Islands, and, after consideration by the War Department d the Board of Review, it was decided to include it in the estiates. It is now decided that it is not necessary.

MAINTENANCE, REPAIR, AND OPERATION OF AUTOMOBILE.

Mr. SHERLEY. The next item is, "For maintenance, repair. and operation of one automobile"; expenditures are authorized to an amount not exceeding $900 during the fiscal year 1918, from funds available from appropriations for fortifications in the Hawaiian Islands.

Col. WINSLOW. That is not an appropriation, but it is an authorization to use for the upkeep of the automobile portions of appropriations made for fortifications purposes.

Mr. SHERLEY. It is the same item as the one submitted last year?

Col. WINSLOW. Yes, sir; it is the same item.

THURSDAY, DECEMBER 14, 1916.

CAPE HENRY, VA.

(See pp. 9. 19.)

STATEMENT OF LIEUT. COL. J. P. JERVEY, CORPS OF ENGINEERS, DISTRICT ENGINEER OFFICER, NORFOLK, VA.

Mr. SHERLEY. Col. Jervey, you are the district engineer officer down at Norfolk?

Col. JERVEY. Yes, sir.

Mr. SHERLEY. Col. Winslow suggested that you would be able to give us a little later information touching the situation that exists there relative to certain rights of way in connection with the fortifications at Cape Henry.

Col. JERVEY. I think Col. Winslow has given you the previous history of the effort to get this right of way transferred by the railroad to the United States. As the matter now stands the railroad officials proper are willing to make the transfer, but it seems that certain bondholders, as represented by a trust company in New York, are unwilling to approve of this transfer or trade, upon the ground that they are exchanging real estate to which they have a title in fee for an easement which though it is called perpetual may yet be revoked some time by the Government. The trust company makes the statement that they can not legally consent to such a transfer. In view of this fact, and under instructions from the Chief of Engineers, I started condemnation proceedings through the district attorney. At present he is engaged in working the matter up. He has either advertised, or has actually let, the preparation of the necessary abstracts and other papers, and I am also told that as soon as this is completed it will probably be possible to get a special term of the district court to finish up the condemnation proceedings. So it is hoped that within six weeks or two months this condemnation can be completed and that the work will go ahead.

Mr. SHERLEY. There is no other complication that remains to be adjusted?

Col. JERVEY. There was a question of the transfer of a right of way by the Cape Henry syndicate connecting the main reservation with the wharf property, but that has been adjusted, so far as the 'ape Henry syndicate is concerned, and the papers are now with the udge Advocate General, and I presume will be completed shortly. 'he syndicate has made the concessions which we asked, and we drew p and signed an agreement, which has been forwarded to the War epartment.

Mr. **SHERLEY.** In these condemnation proceedings Col. Winslow estified, I believe, that they expected to submit in evidence the con-essions that the Government was prepared to make in the way of ght of way in lieu of the right of way that was being condemned, nd that it was believed that thereby a settlement might be had on hose terms without the need of paying a money consideration for the ght of way which is to be condemned.

Col. **JERVEY.** From my conversation with the local railroad officials n Norfolk, I believe that can be arranged along those lines. In ther words, no money consideration will probably come into the ase. As I understand it, the bondholders have no objection other han a legal one to the proposed transfer, but they think that the ondemnation of the right of way by a Federal court, of course, will emove this legal objection.

TUESDAY, DECEMBER 12, 1916.

STATEMENT OF BRIG. GEN. WILLIAM CROZIER, CHIEF OF ORDNANCE.

URCHASE, MANUFACTURE, AND TEST OF MOUNTAIN, FIELD, AND SIEGE CANNON, UNITED STATES.

Mr. **SHERLEY.** General, the first item in which the Ordnance De-artment is interested, I believe, is found on page 36 of the bill, "For urchase, manufacture, and test of mountain, field, and siege cannon, tc." You are asking for $10,800,000 in cash and a contract authori-ation of $2,200,000. Last year you requested $2,486,500 and a con-ract authorization of $3,500,000, I think, and you were allowed 2,821,500 and a contract authorization of $3,500,000?

Gen. **CROZIER.** Yes.

Mr. **SHERLEY.** Will you state the condition of your balances under is item?

BALANCES UNEXPENDED.

Gen. **CROZIER.** On the 9th of this month the Treasury balance was 3,356,363.39. Of this amount there was due to meet the obligations contracts and of orders to arsenals which had already been made placed $2,111,345.70, leaving an unallotted balance of $1,245,017.99. 'he unallotted balance is rather larger than it usually is at the time appeared before the committee.

Mr. **SHERLEY.** Last year when you appeared before the committee . testified that there was a rather large unallotted sum in your nds, due to the fact that you had not then agreed to the letting t a contract that was the result of a bid which had been made, but ich needed the approval of the Secretary of War before being tered into. Was that contract finally entered into?

Gen. **CROZIER.** It was; yes, sir. Shortly after the time of my ap-arance before the committee, the Secretary of War approved the king of that contract, and it was made.

Mr. Sherley. That contract was to provide what matériel?

Gen. Crozier. It was to provide some 4.7-inch guns and carriages and some 6-inch howitzers and carriages, together with the designs for those pieces and carriages. The number of guns and carriages covered by the contract was not very great. It included four of the 4.7-inch guns with carriages and two 6-inch howitzers and 21 sets of forgings for 6-inch howitzers and twenty-three 6-inch howitzer carriages. One of the principal objects of this contract was to secure from the Bethlehem Steel Co. the design for this matériel which might thereafter be used for further manufacture, and thus to relieve my own office of the labor with the attendant required time of making the designs. The Bethlehem Steel Co. had a force which was capable of making the designs.

Mr. Sherley. That contract was for about $600,000?

Gen. Crozier. Yes; that was approximately the sum involved.

Mr. Sherley. And the funds were obtainable not only from the appropriations carried in the fortifications act, but also from those carried in the Army act?

Gen. Crozier. It appears they were all finally obligated, whatever the original tentative idea might have been, from the appropriations made in this act.

Mr. Sherley. General, you have just testified there is a Treasury balance of three million three hundred and odd thousand dollars, of which there is allotted two million one hundred and eleven odd thousand dollars, leaving an unallotted balance of $1,245,000 and some odd dollars?

Gen. Crozier. Yes.

Mr. Sherley. What contracts, either with private manufacturers or arsenal obligations, are there outstanding for which there have been no funds allotted, if any? In other words, I want to find out whether this unallotted balance now is really a free balance or whether it will be necessary to take up contract authorizations now outstanding?

Gen. Crozier. The unallotted balance is a free balance in that it is thus far entirely unobligated for any purpose. I, however, plan to obligate it for a particular purpose, and I expect now that most of it will be used to give orders under contract or to the arsenals, and probably under contract, for some 9½-inch howitzers.

Mr. Sherley. Before we go into what you expect to use it for, what I want to get at now is this: You entered into a six hundred and odd hundred thousand dollar contract. You were authorized in previous acts to incur contract obligations which mean either obligations with private manufacturers or arsenal obligations. Are there now any, either with private manufacturers or with the arsenals, that have not been met either by funds that have been paid or by the two million one hundred and eleven odd thousand dollars of allotted funds that are in the Treasury to be paid.

Gen. Crozier. There are none which are not met in one of those ways. You understand, of course, in giving these orders or making contracts we incur obligations under the authority to contract obligations.

Mr. Sherley. I understand you have been authorized to incur obligations. I am not complaining of that. What I am trying to find out, if it is possible, is what obligations there are now out that your funds are required to meet. Now, evidently there is $2,111,000 worth of work, some of which may be in the form of obligations that you have allotted funds for, but are there in addition to that any outstanding obligations that will mature that would take up this unallotted balance?

Gen. **Crozier.** There are none.

Mr. **Sherley.** If you should stop work now and not undertake any new work would you have, after the completion of all the work now under way, $1,245,000?

Gen. **Crozier.** Under this item; yes, sir.

Mr. **Sherley.** That is the situation?

Gen. **Crozier.** That is the situation; yes.

Mr. **Sherley.** Now, what is it you propose to do with this $1,245,000?

Gen. **Crozier.** The principal thing is to order 9½-inch howitzers and their carriages.

Mr. **Sherley.** How many?

Gen. **Crozier.** I have advertised for 20; that is, 10 batteries of two each, and had thought that possibly I would divide that into two contracts.

Mr. **Sherley.** Of course this sum would not pay for that number of batteries.

Gen. **Crozier.** No; it would not, and part of those 9½-inch howitzers would have to be paid for out of the other appropriation under which I also have some funds still free. But these are all the funds that are free under this appropriation. There is no obligation entered into yet, you understand, mortgaging them. They are entirely free funds.

Mr. **Sherley.** Have you enough free funds from all sources to build these twenty 9½-inch howitzers?

Gen. **Crozier.** Yes, sir; and more than enough. But in all these answers I am counting upon the $3,500,000 worth of contract obligations which I was authorized by the last act to incur, and part of which I have incurred.

MANUFACTURE AT ARSENALS.

Mr. **Good.** General, on what principle do you make the allotment, so far as the arsenals are concerned, for labor? Do you allot a certain amount for all the work you expect to do in the arsenals during the year?

Gen. **Crozier.** Yes; including labor and the raw material, which has to be purchased at the arsenal to carry out the order.

Mr. **Good.** So in your allotment you have already taken care of the cost of labor in the arsenals for this purpose during the whole year?

Gen. **Crozier.** Yes; making the best estimate we can.

Mr. **Sherley.** General, is that quite the way you do it? Do you not estimate the cost of doing a particular piece of work in the arsenal?

Gen. **Crozier.** Yes.

Mr. **Sherley.** Including the labor cost, the cost of materials, of fuel, and all other incidentals, and then that amount of money is set aside for doing that particular piece of work?

Gen. CROZIER. That is right.

Mr. SHERLEY. You do not undertake to set apart so much money for a year's work in the arsenal, do you?

Gen. CROZIER. No; and in answering Mr. Good's question I supposed that was what he had in mind. I keep on giving orders in the manner you mention until I have used up all the arsenal's capacity for a year, and generally for more nearly two years than one year. I am doing that now, considering the arsenal's capacity to be on a two-shift basis.

FIELD ARTILLERY.

GOVERNMENT OR PRIVATE MANUFACTURE OF MUNITIONS.

Mr. SHERLEY. General, can you submit a table showing just what is now under manufacture, either at the arsenals or in private manufacture, touching field artillery?

Gen. CROZIER. Yes; I will be glad to do that. I can give you now the principal items, if you like. You may remember that the last fortifications act was approved on July 6, 1916. At that time there was under way, ordered from appropriations that had been available before the passage of that act, at the three principal arsenals where field-artillery work is done work to the amount of $1,250,000. When I am speaking of field-artillery work I am making a distinction between guns, carriages, limbers, caissons, etc., and ammunition. This statement I am making now does not include the ammunition. The three principal arsenals are the Rock Island Arsenal, the Frankford Arsenal, and the Watervliet Arsenal. Now, since July 6 there has been ordered from all the arsenals—those three and Watertown Arsenal also, where we do not do so much field-artillery work but where we do some—an amount represented by $3,550,000, about. These totals I am giving you now relate to orders which have been given for this kind of material from appropriations made both in this bill and the Army bill, so that those two sums, taken together—the field-artillery work that was on hand at the time of the passage of the last fortification act and the field-artillery work which has since been ordered from the arsenals—amount to $4,800,000.

Now, I expect to order from the arsenals, from the appropriations made at the last session, an additional amount represented by $2,600,000, so that the total would then become $7,400,000—that is, for work on hand at the time of the passage of the last fortifications act, that which has been ordered since the passage of that act, and that which I expect to order from the funds carried by that act and the Army appropriation act, all from arsenals. Now, the principal items which will be covered by the sums I have mentioned, as far as the material already ordered is concerned, are six 3-inch ammunition batteries; 144 carriages for 3-inch guns; two hundred and sixty-two 3-inch guns; one experimental [illegible] howitzer and carriage; and some war-reserve parts. The principal items that remain to be ordered from the arsenals are the battery and store wagons, etc., for sixty 3-inch batteries; twenty-eight [illegible] howitzer carriages; a number of panoramic sights; [illegible] store wagons for the 4.7- [illegible] is being secured under [illegible] instruments, and some war-reserve parts. [illegible] of the statement, as far as the work ordered and to be ordered from arsenals is concerned.

Coming to the work ordered and to be ordered under contract, there has been ordered, under contract, work calling for $4,030,000, and there is still to be ordered, under contract, work calling for about $5,750,000, making, together, $9,780,000.

The principal items which have been ordered under contract are the ammunition vehicles for sixty 3-inch gun batteries, the carriages for twenty-four 3-inch gun batteries, some artillery tractors and ammunition trucks, and some range finders, and the principal items still to be ordered under contract are ten 3.8-inch howitzer batteries, eight 4.7-inch gun batteries, nine 6-inch howitzer batteries, twelve 9.5-inch howitzer batteries. I remind you again that these orders cover the appropriations made in both the fortification bill and the Army bill. Now, summarizing somewhat, the grand total ordered and to be ordered from the appropriations and authorizations made at the last session of Congress is $15,930,000 which, you will remember, excludes the $1,250,000 worth of work already under way from the preceding appropriations, which I spoke of a moment ago. This will leave a working balance of $586,500, which I have not obligated and am not contemplating the obligation of immediately, wanting this manufacture to get further along before I let the control of that balance get out of my hands, and which accords with the grand total for Field Artillery, of appropriations and authorizations made at the last session, of $16,516,500.

Mr. Sherley. About $16,500,000 was appropriated from all sources last year and about $1,300,000 in previous appropriations that had not been expended.

Gen. Crozier. For work which was being done.

Mr. Sherley. Making approximately $18,000,000 worth of work—something under $18,000,000?

Gen. Crozier. Yes; $17,750,000, something like that.

Mr. Sherley. Of that what proportion is arsenal work and what proportion private contract work?

Gen. Crozier. The arsenal work amounts to $7,400,000 and the contract work to $9,780,000, and the working balance not yet obligated to either $586,500.

Mr. Sherley. That would be something like a little over 40 and a little less than 60 per cent, respectively, of work in arsenals and by contract?

Gen. Crozier. Well, it looks about like that. It may be interesting to have your attention called to the point that this money, obligated under orders given to the arsenals, will occupy the capacity of those arsenals for something like two years.

Mr. Sherley. So that if no more moneys of any sort were appropriated the arsenals would still be engaged on practically a two-shift basis to their capacity for two years yet to come?

Gen. Crozier. Yes; except as that might be interfered with by running out of a certain class of work which required certain particular machines; but, in general, the statement that you make is the condition.

Mr. Sherley. That is true as to the present capacity of the arsenals?

Gen. Crozier. Yes.

Mr. Sherley. We have made various appropriations looking to increasing the capacity of a number of the arsenals very considerably.

ROCK ISLAND, FRANKFORD, AND WATERVLIET ARSENALS.

Gen. **Crozier**. Those appropriations do not affect this statement very much, as you will see when I run over the principal ones of them. At the Rock Island Arsenal the large appropriation which you made at the last session was for a field artillery ammunition plant and, as I noted a moment ago, this statement does not refer to ammunition. At the Frankford Arsenal the principal appropriations relate also to field artillery ammunition. At the Watervliet Arsenal the considerable appropriation made last year was for an increase in capacity for making the heaviest kind of field artillery; there was not very much of an appropriation made for manufacturing field artillery.

Mr. **Sherley**. Most of it was for seacoast guns?

WATERTOWN ARSENAL.

Gen. **Crozier**. Yes, sir; and principally of the largest caliber. At the Watertown Arsenal the appropriations were for enlarging considerably the capacity for making seacoast gun carriages and the capacity for making seacoast armor-piercing projectiles.

Mr. **Sherley**. So that practically the increased capacity of the arsenals that will result from appropriations made for the increase of those arsenals will be in regard to material other than the field artillery that you have enumerated as now being under way at the arsenals?

Gen. **Crozier**. Yes, sir; that is the state of the case.

Mr. **Sherley**. General, will you submit a table, similar to the table that we have heretofore had, showing the type and caliber of batteries now on hand and provided for by appropriations?

Gen. **Crozier**. Yes, sir.

Mr. **Sherley**. Together with a column showing the batteries remaining to be provided for under the old Greble Board's project and those remaining to be provided for under the Treat Board's project, as finally approved by the Secretary of War?

Gen. **Crozier**. Yes, sir.

FIRING BATTERIES.

Type.	Total required.		Total provided for.	Total remaining to be provided for.		Provided for in excess of Greble Board project.
	Approved, Treat Board project.	Greble Board project.		Approved, Treat Board project.	Greble Board project.	
3-inch mountain howitzer	30	27	1	29	26	
3-inch gun	432	195	213	219		[illegible]
3.8-inch howitzer	201	36	25	149	11	
4.7-inch howitzer		35	27		8	
4.7-inch gun	105	15	23	82		[illegible]
6-inch howitzer	105	15	23	82		[illegible]
9.5-inch howitzer	105		12	93		
	978	323	324	654	45	[illegible]
Tractors for 9.5-inch howitzer	845		48	797		

AMMUNITION BATTERIES.

Type.	Total required.		Total provided for.	Total remaining to be provided for.		Provided for in excess of Greble Board project.
	Approved, Treat Board project.	Greble Board project.		Approved, Treat Board project.	Greble Board project.	
-inch mountain howitzer	8	6½	....	8	6½	....
-inch gun	30	32	17	13	15	....
-inch howitzer	60	15	....	60	15	....
7-inch howitzer	....	15	....	....	15	....
4.7-inch gun	15	6	....	15	6	....
-inch howitzer	30	6	....	30	6	....
.5-inch howitzer truck Co's (3-ton)	33	....	....	33	....	....
	176	80½	17	159	63½	....

TREAT BOARD.

Mr. SHERLEY. When you testified last year, although the Treat Board report had been submitted and had gone through various boards and officers' hands for comment and revision, it had not been finally approved?

Gen. CROZIER. That is right.

Mr. SHERLEY. Shortly thereafter it was approved in a modified form?

Gen. CROZIER. Yes, sir.

Mr. SHERLEY. Can you state in money value what it required to be expended, speaking now of the guns and excluding ammunition?

Gen. CROZIER. I can give you those figures. The statement should be made in the beginning, however, that the modifications made before the report was approved included its application to the force as it was finally fixed by the national-defense act of June 3.

Mr. SHERLEY. In that connection, what was the force that it was based on?

Gen. CROZIER. It was something like a million men, but it was not exactly of the same composition as that which was contained in the original report.

Mr. SHERLEY. I did not mean, necessarily, the detailed division, but, roughly speaking, it contemplated a million men, including officers and men?

Gen. CROZIER. Yes, sir; and, roughly speaking, that is what it contemplates yet. You will understand that in stating these figures we have to take some basis of prices; they have been changing pretty rapidly. So, in order to get back to something that we can compare the different stages of that report with, if you like, I will take the prices that that board used. The total required under the finally approved Treat Board project—and by required I do not mean yet to be furnished, but the total required, including what has been furnished—amounted for the National Guard, in such matériel as guns, carriages, limbers, caissons, etc., to $83,561,188, and in harness $5,648,136, making a total for the National Guard of $89,000,000 plus. For the Regulars and Volunteers there is required matériel, such as guns, carriages, limbers, caissons, etc., amounting to $60,606,326, and for harness $4,241,660, making a total of $64,000,000 plus. That makes, then, a grand total, of the class of matériel mentioned, of $154,000,000 plus.

Mr. SHERLEY. There is on hand or appropriated for the Regulars and the militia what amount in dollars of matériel of this class?

Gen. CROZIER. $37,214,572, which leaves to be appropriated for, matériel of this class amounting in value to $116,842,738.

Mr. SHERLEY. Can you divide that $37,000,000 into the two items of harness and guns, and also as it relates to the militia and the Regulars.

Gen. CROZIER. It is made up as follows:

Matériel for Regulars and Volunteers	$15,266,326
Harness for Regulars and Volunteers	602,290
Total for Regulars and Volunteers	15,868,616
Matériel for National Guard	19,886,411
Harness for National Guard	1,459,545
Total for National Guard	21,345,956
Grand total	37,214,572

Mr. SHERLEY. You are asking how much from all sources this year for this class of matériel?

Gen. CROZIER. The cash estimates are, under this item in the bill which you are speaking of, $10,800,000, and under field artillery for the National Guard, in the Army bill, $10,600,000, making together $21,400,000, and the contract authorizations asked for are, under this item in this bill, $2,200,000, and under field artillery for the National Guard, $3,400,000, making a total of contract authorizations of $5,600,000, and a grand total of cash and contract authorizations of $27,000,000.

Mr. SHERLEY. Now, you have given a statement as to the total in money value yet to be supplied on the basis of the prices that were used at the time the Treat Board made its report. The estimates that you are submitting contemplate the completion of what percentage of that program?

Gen. CROZIER. It contemplates the completion of one-seventh of that program still remaining to be completed; but in doing so, as I think I have mentioned already, I am using prices 25 per cent greater than the Treat Board prices.

Mr. SHERLEY. In figuring on one-seventh are you asking for one-seventh of the sum necessary to complete the program of the Regulars and of the militia as separate or are you asking for one-seventh of the whole without regard to what percentage is now supplied for the Regulars and the militia?

Gen. CROZIER. I am asking for one-seventh of the funds necessary to procure the remaining material for the Regulars and for the Volunteers, and I am asking separately, in connection with the Army bill, for one-seventh of the funds necessary to procure the remaining material for the National Guard. In other words, I am separating them in the esitmates and am asking for one-seventh of each total separately.

Mr. SHERLEY. The result being that if this policy were pursued in the way of estimates and the respective committees reporting the fortification and Army bills should allow in their entirety the estimates, there would be seven appropriations required in each bill?

Gen. **Crozier.** Yes, sir; and the projects would be completed at the same time.

Mr. **Sherley.** So far as the appropriations were concerned?

Gen. **Crozier.** Yes, sir; so far as appropriations are concerned.

Mr. **Sherley.** You are asking $10,800,000 in cash and $2,200,000 in contract authorizations, making in cash and authorizations $13,000,000. Now, what do you expect to do with that money in the event it should be given to you?

Gen. **Crozier.** I intend to use $1,728,000 for 12 batteries of 4.7-inch guns; $1,692,000 for 12 batteries of 6-inch howitzers; $2,400,000 for 15 batteries of 9.5-inch howitzers. I intend to use $962,500 for additional fire-control equipment and $817,500 for war-reserve parts. Those figures will add up $7,600,000. Now, I will add 25 per cent to that, because the prices under which I have given you these figures are the Treat Board prices, and we must allow for a rise in prices of 25 per cent, which amounts to $1,900,000, bringing the total up to $9,500,000. That is the material I intend to get in addition to that which has been heretofore provided for, whether ordered or not. Now, to meet that which has heretofore been provided I will need, in addition, the contract authorization of last year, $3,500,000, making a grand total of $13,000,000 called for by the estimates for cash and contract authorization.

CONDITION OF WORK AT ARSENALS.

Mr. **Sherley.** General, you have testified that for this character of work, and treating as negligible the increased capacity of the arsenals as it relates to this class of work, because there has been practically no material increase in capacity provided for such work, your arsenals will be loaded up with work for two years?

Gen. **Crozier.** Yes.

Mr. **Sherley.** It follows, therefore, that you practically contemplate, with the exception of such sum as is necessary to take care of authorizations heretofore made or authorized to be made, that you will have to spend this money with private manufacturers?

Gen. **Crozier.** That will probably be the case and must necessarily be the case unless I load the arsenals up with work beyond two years. I can say, in accordance with what I have already stated about the amount in cash value of the orders given to the arsenals, that the total capacity of the Rock Island, Frankford, and Watervliet Arsenals for field-artillery work, the class which we are talking about, is $3,860,000 per annum; and, as I have already said, they have in hand now, and to be placed from funds already appropriated, orders amounting to $7,400,000, the capacity mentioned being on a two-shift basis. Now, that in sum would mean that they are supplied with work for about two years; but in detail it does not exactly mean that. The fact is that two of the arsenals, Rock Island and Frankford, are supplied with work for more than two years, and Watervliet Arsenal is supplied with work for less than two years, the prominent point with reference to that being that Watervliet Arsenal, where the guns are made, has on a two-shift basis capacity to take care of this eight-year project for the supply of field artillery; but the other two arsenals have not.

Mr. SHERLEY. So that to the extent the money will be expended in making the actual guns, you have and will use the arsenal capacity for the entire project?

Gen. CROZIER. I can about do that; yes. I think for certain orders, on account of considerations other than that of capacity, it would be desirable to give some orders for guns or howitzers to private manufacturers, as illustrated by the order for the small number of 4.7-inch guns and the 6-inch howitzers I have given to the Bethlehem Steel Co.

Mr. SHERLEY. General, assuming that appropriations were made on the basis of one-seventh so as to require seven annual appropriations, and ignoring the fact that now the arsenals have work which will occupy them practically for two years, you have a capacity in the arsenals to take care of about one-sixth of the total amount of work?

Gen. CROZIER. Measured in money value; yes.

Mr. SHERLEY. Of course, you have already explained that as to a certain character of work you have capacity sufficient for all of the project.

Gen. CROZIER. Yes.

Mr. SHERLEY. As to others you would have less than one-sixth?

Gen. CROZIER. Yes.

Mr. SHERLEY. But figured in money value, you have capacity of about one-sixth, using the arsenals on a two-shift basis and assuming that appropriations would be made over a period of seven years?

Gen. CROZIER. Yes; that is right.

Mr. SHERLEY. But now you are so situated by virtue of work already in the arsenals or in contemplation growing out of previous appropriations and authorizations that this appropriation, if it is to be expended within the next two years, would have to be expended practically outside in private manufacture, except as it may relate to the gun or piece itself?

Gen. CROZIER. Yes.

Mr. SHERLEY. Now, General, while you have always very frankly told the committee what was in contemplation by the Ordnance Department as to character of manufacture, in point of fact the appropriation is so made as to leave the department free to expend moneys for any sort of mountain, field, and seige cannon with their accessories, etc.?

Gen. CROZIER. Yes.

Mr. SHERLEY. Is the present program which you have outlined in detail, looking to the creation of 4.7-inch guns and 6-inch howitzers and 9½-inch howitzers, the result of a determination by a board as to a whole scheme, and what of that whole scheme shall first be supplied?

Gen. CROZIER. The program of expenditure of the funds, including the contract authorization which we are now asking for, is made with reference to the program of the modified Treat Board, taking the material contemplated by that program in the order of its military necessity.

Mr. SHERLEY. General, your department has always been free touching funds carried under this item, so far as the language of the appropriation is concerned, to expend it for such character of fieldpieces as the department thought wise?

Gen. **Crozier.** Yes; and in giving the program of expenditure I have stated what was our intention now. That intention may be modified by various circumstances. As an illustration, it may be that a design which we have under way and which we expect to finish in time to build to it from the funds asked for may not be finished in time, and, therefore, we will not be able to carry out that part of the building program; or it may be that some experimental gun which we have under test may not turn out perfectly successful, and therefore we may not be in position to reproduce it.

Mr. **Sherley.** Or it may be in the future, as it has been in the past, that the cutting of the amount asked resulted in the necessary elimination of part of the program presented.

Gen. **Crozier.** Yes; and in that case we would have to rearrange the program to suit the funds appropriated.

Mr. **Sherley.** Is this program determined by the Ordnance Department itself or is it determined as a result of joint action by it and other departments of the War Department?

Gen. **Crozier.** It is determined by the Ordnance Department itself in the first instance. It takes the program and forms a judgment as to what part of it should be carried out first. The Department's estimate, of course, is submitted to the Secretary of War, and he has opportunity to change it if he wants to. As a rule he does not change it.

Mr. **Sherley.** The point I was coming to is this: There might be a view held, for instance, by Field Artillery officers as to the need of certain character of pieces over other pieces, and there might be a view of the ordnance people, somewhat the result not only of their judgment as to the military need of a piece but also their judgment and knowledge of the condition of design and conditions of manufacture, which would cause them to come to a conclusion other than that of the Field Artillery Corps. If I understand you, heretofore the matter has been with the Ordnance Department, subject, of course, to the approval of the Secretary of War.

Gen. **Crozier.** There is always opportunity for anyone connected with the Field Artillery service, and particularly the officers of the General Staff who are of the Field Artillery, to express their views as to what the program ought to contemplate. All the officers of the General Staff would have to do would be to make their representations to the chief of the War College Division of the General Staff, and he would present a memorandum to the Chief of Staff, which would probably come to me for comment, and upon which a conclusion would be reached.

Mr. **Sherley.** When the Treat Board made its report it made, as I understand, a detailed report indicating the number and type of guns desired for an army of a given size. Did it also indicate the relative importance of those guns and what, in its judgment, should be supplied first?

Gen. **Crozier.** Yes; the Treat Board did give some conclusions as to the relative importance of certain things. For instance, I think that the report of the board itself placed the ammunition batteries behind the fighting batteries, and therefore you will see that the program of expenditure of the funds which I am asking for now does not include any ammunition batteries. And I can say, in general, that that board said everything along that line that it was thought worth while to say; that is, the order of precedence in carrying out the program.

Mr. SHERLEY. And the Ordnance Department, in determining on this specific program, had in mind the recommendations which had been made by the Treat Board?

Gen. CROZIER. Yes.

Mr. SHERLEY. The purpose of these questions, General, is to ascertain whether the War Department is being left free, other than in the amount of moneys given to it, to carry out the expert judgment of its personnel as to the character of field artillery which is to be supplied.

Gen. CROZIER. Yes; the War Department is so left free.

Mr. SHERLEY. You have estimated a 25 per cent increase in the cost of the work?

Gen. CROZIER. As compared with the Treat Board's prices.

LIMITATION OF COST.

Mr. SHERLEY. It appears that most of this work will need to be done, if done within the next two years, through contracts with private manufacturers. We have a limitation upon the appropriation, made last year, which prohibits the expenditure of moneys where the price is 25 per cent greater than the cost of doing similar work at the arsenals?

Gen. CROZIER. Yes.

Mr. SHERLEY. Assuming that that same limitation is put upon this appropriation will you experience any difficulty in entering into contracts?

Gen. CROZIER. With reference to field artillery material we have not thus far experienced any difficulty in entering into contracts: with reference to seacoast artillery material we have. It is something of a guess whether we may be embarrassed in the future by that provision, in case it should be continued. We see in the press certain statements to the effect that foreign orders are falling off in this country; if they should fall off to any considerable extent I think it likely that we will not encounter difficulty with future contracts.

Mr. SHERLEY. As to this character of material do you contemplate that you will be able to find many manufacturers or only one or two in a position to bid and perform the work in the event that they receive the contracts?

Gen. CROZIER. There is a number of manufacturers in the country whose plants would enable them to carry out these contracts, except as to the building of the fieldpieces themselves. There are only a few who can build those fieldpieces.

Mr. SHERLEY. As to the fieldpieces, you have a sufficient capacity yourself, so that you are not necessarily concerned with that phase of it?

Gen. CROZIER. That statement is true with reference to the manufacturing of the fieldpieces from the material to be furnished, but we do not ourselves make the forgings for these fieldpieces, and the number of establishments which can supply those forgings in this country, particularly for the larger sizes of fieldpieces, is limited.

Mr. Sherley. There are practically two concerns, are there not—the Bethlehem company and the Midvale company?

Gen. Crozier. Yes, sir. With reference to that point I am not certain that the prohibition is operative, because we have no arsenal cost for making these forgings; we do not make them ourselves and, therefore, we would have to refer to that portion of the wording of the act which deals with the estimated cost in case we do not make the material ourselves. If we should include in the estimated cost, in such cases, the cost of the plant it is very improbable that the private manufacturers would be more than 25 per cent greater than the arsenal estimated cost.

Mr. Sherley. Would you be warranted in including the cost of a plant to the extent of putting the whole cost on a limited output, or would you not have to simply apportion that in arriving justly at what the estimated cost might be?

Gen. Crozier. I suppose that the ordinary business method would be to include simply a reasonable amortization of the plant in the estimated cost of material.

Mr. Sherley. As to other parts of this material do you anticipate that there will be a number of manufacturers in a position to bid?

Gen. Crozier. I think so; yes. That is, however, in only those cases in which we advertise for manufacture from designs to be furnished by ourselves. When it is a question of including the design with the manufacture there are very few who can bid.

Mr. Sherley. As to this particular appropriation the ordnance department has actually made the designs for all these pieces, has it not?

Gen. Crozier. No. We are, as I stated earlier in the hearing, getting new designs, as well as manufacturing material, for 4.7-inch guns and 6-inch howitzers and carriages.

Mr. Sherley. By that do you mean that you are getting designs that are different from the designs that you have made?

Gen Crozier. The designs are different from the designs that we have made, but we are able to prescribe the conditions that the designs should meet sufficiently closely as to enable this establishment, which has at the head of its designing force an officer who used to be in the ordnance department and who has in his drafting force several draftsmen who have been trained in the ordnance department, to furnish designs. Now, I can go a little further and say that we are now advertising for some 9.5-inch howitzers and carriages which are to include the designs, and which designs, when made, we think will adapt to our situation certain foreign designs that come pretty close to what we want.

Mr. Sherley. After such a contract is made do the designs become the property of the Government in the sense that they can then be used by the Government both for its own manufacture in its arsenals and also for use by other manufacturers?

Gen. Crozier. They are intended to become the property of the Government in that way.

Mr. Sherley. So that wherever you have in the past entered into a contract for both the design and the manufacture in the future as to that particular piece you are in a position to give to all bidders the use of the design?

Gen. **Crozier.** Yes; and thus to invite competition in the manufacture.

Mr. **Sherley.** As to all of these particular pieces, then, you would be in a position in the future to supply any bidders with the designs?

Gen. **Crozier.** If we are successful in getting propositions which we can accept for the 9.5-inch howitzers, yes.

Mr. **Sherley.** Have you any reason to doubt your ability to get a bid within the limitation placed upon the fortification act for the 9.5-inch howitzers?

Gen. **Crozier.** I think we will get bids within that limit. If we do not, what we will have to do will be to purchase them under the appropriations which may be made in the other bill in so far as they are free from limitations—and they are usually partially free—and make one of those shifts that we spoke about a moment ago in the program of procurement.

Mr. **Sherley.** Assuming, of course—and I have no doubt that was in your mind—that the bid made represented to the War Department a fair bid, even though it was 25 per cent over what was the estimated cost of arsenal manufacture?

Gen. **Crozier.** Yes, sir; of course.

Mr. **Good.** General, I observe on page 111 of the hearings of last year that the table which you submitted segregated the batteries into firing batteries and ammunition batteries. What is the distinction?

Gen. **Crozier.** The firing battery is what you have always thought of as a battery, consisting of guns, their carriages, and the vehicles carrying the ammunition which naturally and usually accompany the guns, while an ammunition battery is nothing in the world but a section of an ammunition supply train, with probably specially constructed vehicles of a model best adapted for carrying ammunition instead of general supplies.

Mr. **Good.** Last year you spoke about discontinuing the manufacture of 3-inch mountain howitzers. Are the larger types of guns carried in this item as large as the largest guns used by the armies of Europe in this present war?

Gen. **Crozier.** No. The largest caliber which has been provided for supply to our service in quanity is the 9.5-inch howitzer, which fires a projectile weighing 480 pounds. Now, there are in use in the armies of Europe howitzers up to 16 inches in caliber, and we hear rumors of even larger. With reference to those we have not thus far considered the evidence complete that they would be needed in the kind of warfare that might be expected upon this side of the ocean, and therefore we are confining the construction of howitzers of larger calibers than 9.5 inches for the field service to experimental pieces, believing that we can get better information ourselves as to what those pieces do and in regard to which we hope in the meantime to get better evidence from the other side as to their ordinary necessity.

RANGE OF GUNS.

Mr. **Good.** What is the extreme range of the largest gun that you specify here?

Gen. **Crozier.** The 9.5-inch howitzer, with a 480-pound projectile, which I mentioned a moment ago, will have a range of 12,000 yards.

Now, some of these European pieces of corresponding caliber to our pieces use lighter projectiles than we do, and it is not even impossible or out of accord with what is sometimes the practice to have two weights of projectiles for the same piece, depending upon the range that you wish to obtain. With a projectile of 360 pounds for that howitzer we can get a range of 16,000 yards.

Mr. **Good**. What is the range of a 6-inch howitzer?

Gen. **Crozier**. The one of the existing model, with a projectile of 120 pounds, has a range of 6,700 yards; with a lighter projectile, weighing 90 pounds, it has a range of 9,000 yards. The next one, which is under manufacture, will have, with the heavy projectile, a range of 10,000 yards, and with the lighter one—the two having the same weights as mentioned above—it will have a range of 14,000 yards.

SHIFTS AT ARSENALS.

Mr. **Good**. You are using two shifts in the arsenals, as I understand.

Gen. **Crozier**. To the extent to which we have been able to get workmen: where we are not using the two shifts we are not able to get enough men, but we are trying to increase the number all the time. There is great difficulty in securing workmen now.

Mr. **Good**. To what extent are you able, then, to run the arsenals at full capacity on two shifts?

Gen. **Crozier**. None of them are now up to their full capacity on a two-shift basis. Generally speaking, I think we will not get them up to that capacity until late in the spring or early in the summer, and we may not be able to do it then.

Mr. **Good**. How much short of a two-shift basis did you operate last year?

Gen. **Crozier**. Well, it was a varying shortage, not the same at different arsenals and not the same in all departments of a single arsenal. It has even been the case that we have operated some small part of some of the arsenals on a three-shift basis. That has arisen because of the demand for an increased output of some particular machine, and those particular machines were run on three shifts. That happened with reference to some of them at the Watervliet Arsenal, but it has been so irregular that a computation would have to be made in order to state the general percentage.

Mr. **Sherley**. I think what Mr. Good probably wants to know is whether you have been able to run the arsenals up to 75 or 80 per cent of their capacity on a two-shift basis or whether it has been just a little over the one-shift basis.

Gen. **Crozier**. Taking it as we are now I do not believe that we are more than half way between the one-shift and the two-shift basis.

Mr. **Sherley**. That would be 75 per cent?

Gen. **Crozier**. Yes, sir.

Mr. **Good**. How have the private manufacturers, from whom you are securing this class of material, operated their establishments during the past year—on a two or three shift basis?

Gen. **Crozier**. I think that most of them are on a one-shift basis. I doubt if any of them are on a three-shift basis, except the powder plants. Of course, they are on a three-shift basis.

Mr. Good. You spoke of allowing private manufacturers to make designs. It occurred to me that an abuse might grow up following that method, in that it would give the private manufacturer who had submitted the design an advantage when it came to bidding on that design?

Gen. Crozier. He certainly would have the advantage of knowledge, but we would make our contracts so that he would have no claim of control. However, as he would have already made the design, and probably, in order to insure having the design acceptable, have built up to it to a certain extent, he would certainly have the advantage of accurate knowledge. Sometimes in the past that has resulted in his knowing enough to make a higher bid.

Mr. Sherley. In that particular he would not be in any different relationship than a manufacturer who had done a piece of work from the design furnished by the Government, as against other manufacturers who had not?

Gen. Crozier. He would not; that is, upon his being called upon to do it a second time.

Mr. Good. Would he be able to submit a design for a given piece of work in such a way that he would be better equipped to do that work according to that design than any other manufacturer?

Gen. Crozier. That would not be impossible.

Mr. Good. Of course, if that is the case, then it might work to the disadvantage of the Government and to the advantage of a single private manufacturer.

Gen. Crozier. Of course, we would scrutinize that in passing upon the acceptability of the design. Those contracts that we make, when they call for design as well as manufacture on the part of a private party, require that we shall approve the design.

RELATIVE COST OF GOVERNMENT MANUFACTURE AND PRIVATE MANUFACTURE.

Mr. Sherley. General, have you any new data touching the relative cost of Government manufacture and private manufacture of this or other matériel?

Gen. Crozier. Yes, sir; I have some new data. They do not bear out the differences that have, in general, existed before. There is still, in regard to many things at least, a difference in favor of Government manufacture, but it is not as great as it used to be. I have some figures with me, but I can give them, perhaps, more appropriately in the hearing pretty soon. I have none with reference to this particular item that we are on now.

Mr. Sherley. Suppose you submit with your hearings a table giving such additional data, or data not yet given, as you may have touching Government and private manufacturing costs.

Gen. Crozier. I shall be glad to do so.

What I said a moment ago was not quite accurate, in that I have a few things here in relation to this item. I can give you some of those data now, or can put them in the table.

Mr. Sherley. In making up this table I presume that you will pursue your custom of including in the Government cost all of the items that properly apply to private manufacturing cost other than that of profit.

Gen. **Crozier.** And some other costs that the Government is not subjected to, like selling cost.

Mr. **Sherley.** And where there is any reason to depart from that rule, if there should be, I hope you will, in your table, indicate it by proper footnote explanations.

Gen. **Crozier.** Yes, sir.

Statement of purchases made of mobile artillery ammunition components in connection with the expenditure of 1917 appropriations—Total contract cost as compared with total cost of manufacture of similar articles at Frankford Arsenal.

(The total arsenal cost is arrived at by adding 12 per cent to the appropriation cost to cover the overhead arsenal burden and the War Department burden. The total contract cost is obtained by adding 6 per cent to the contract price to cover the cost of inspection and the War Department burden.)

Components.	Contract costs.				Arsenal costs.			Contract cost over (or under) arsenal cost.
	Quantity purchased.	Contract price.		Total contract cost.	Appropriation cost.		Total arsenal cost.	
		Net.	Plus 6 per cent.		Net.	Plus 12 per cent.		
inch shell, finished, machined	205,800	$3.44	$3.65	$750,429.12	$3.46	$3.88	$797,516.16	—$47,087.04
inch shrapnel cases, finished, machined	50,650	2.90	3.07	155,698.10	2.06	2.31	116,859.68	38,838.42
inch cartridge cases	200,000	1.34	1.42	284,080.00	1.14	1.28	255,360.00	28,720.00
inch (15-pounder) cartridge cases	11,170	6.96	7.38	82,407.79	3.53	3.95	44,161.71	38,246.08
Do	12,700	7.45	7.90	100,291.90	3.97	4.45	56,469.28	43,822.62
inch shrapnel heads	18,624	1.10	1.17	21,715.58	.70	.78	14,601.21	7,114.37
inch rotating bands	19,000	.25½	.27	5,060.18	.26	.29	5,532.80	— 472.62
inch shell, finished, machined	73,333	10.25	10.87	796,763.04	9.34	10.46	976,337.85	59,985.19
	20,000	11.30	11.98	239,560.00				
inch shrapnel cases, finished, machined	98,287	8.53	9.04	888,691.40	8.71	9.76	958,809.34	— 70,112.94
inch shrapnel heads	95,546	1.25	1.33	126,598.45	.71	.80	75,978.18	50,620.27
inch gun cases	53,500	4.48	4.75	254,060.80	4.14	4.64	248,068.80	5,992.00
inch howitzer cases	66,568	2.41	2.56	170,054.61	2.51	2.81	347,271.92	— 4,341.21
	66,568	2.45	2.60	172,877.10				
inch shell, finished, machined	12,000	20.78	22.03	264,321.60	18.18	20.36	487,669.37	61,659.73
	11,950	22.50	23.85	285,007.50				
inch combination fuses	125,000	[1] 175.00	[1] 185.50	463,750.00	2.04	2.29	285,600.00	178,150.00
Medium caliber base detonator, fuse stock	200,000	1.10	1.17	233,200.00	.64	.72	143,360.00	89,840.00
inch finished, machined steel diaphragms	18,800	.29	.31	5,779.12	.17	.19	3,579.52	2,199.60
inch finished, machined steel diaphragms	166,013	.16	.17	28,155.80	.11	.12	20,452.80	7,703.00
inch finished, machined steel diaphragms	13,485	.18	.19	2,572.94	.17	.19	2,567.54	5.40
inch finished, machined steel diaphragms	96,425	.32	.34	32,707.36	.31	.35	33,478.75	— 771.39
inch rotating bands	220,000	.074	.078	17,256.80	.069	.077	17,001.60	255.20

[1] Per box of 50.

RECAPITULATION.

Grand total contract costs	$5,381,039.19
Grand total arsenal costs	4,890,676.51
Difference	490,362.68

Ordnance Office, November 27, 1916.

Comparative cost of projectiles for seacoast cannon procured by purchase and by manufacture at Watertown Arsenal.

FISCAL YEAR 1915.

	Per pound.
Purchased:	
3,000 6-inch A. P. shell	$0.324
400 14-inch A. P. shell	.315
50 14-inch A. P. shot	.328
35 16-inch A. P. shell	.330
Average	.324
Manufactured:	
1,200 12-inch 700-pound D. P. shell	.251
200 12-inch 1,046-pound D. P. shell	.220
Average	.236

FISCAL YEAR 1916.

Purchased:	
600 6-inch A. P. shell	$0.344
410 14-inch A. P. shell	.306
Average	.325
Manufactured, 1,385 12-inch D. P. shell	.219

Prices given for projectiles procured by purchase include 6.59 per cent to cover cost of inspection and War Department burden; prices given for projectiles manufactured at Watertown Arsenal include royalty and 18.66 per cent to cover arsenal and War Department burdens.

Mr. EAGAN. You say that the proportion of difference in cost is not now as great as it was before; roughly what is the reason for that?

Gen. CROZIER. There are two reasons that I can think of now; one of them is that many private manufacturers have now more experience than they used to have, owing to the European-war orders; another reason is that, for the same reason, they are manufacturing in larger quantities, and still a third reason is that some of them have had such large and such profitable orders from foreign governments that they have been sufficient to wipe off pretty much all the cost of their plants, which are, therefore, now in some cases entirely paid for, and for which they do not, therefore, have to charge an amortization percentage, unless they wish to.

Mr. SHERLEY. The reasons that you have just advanced would seem to indicate that there ought not to be any great difficulty in obtaining proper bids from private manufacturers within the restriction that has been placed upon the expenditure of these funds in the last fortification bill, to wit, 25 per cent excess.

Gen. CROZIER. That is the indication in many things, which is borne out by experience. For instance, we have an order now standing, given last September to the Rock Island Arsenal for 3-inch field gun carriages, and the estimated arsenal cost, plus the overheads that we call the arsenal burden and War Department burden, amounting to about 18 per cent of the actual appropriation cost per carriage, is $6,844. Now, adding 25 per cent to that you reach the figure of $8,555. I invited bids for a considerable number of those carriages, 96 in all, and from one company I got a bid of $8,40, which is within the 25 per cent increase limit, and from another company I got a bid of $9,180, which is beyond it. There are some other illustrations that I could give. For instance, I advertised for a number of 3-inch gun caissons, after having placed the order at the arsenal at $2,124 each. I got four bids in response to that, and the figures ran $1,650, $2,225, $2,375, and $2,500. Now, these were all within the 25 per cent limit, and one of them was actually below the arsenal estimates.

Mr. **Sherley.** I hope that this coming closer together of private manufacturers' cost and arsenal cost is not in any way the result of a lessening in economy or in the splendid showing that the arsenals have heretofore been able to make. In other words, I hope that they are coming down and that you are not going up.

Gen. **Crozier.** In many things the arsenal cost and everybody elses' cost has increased.

Mr. **Sherley.** I do not mean the necessary increase that comes from the increased cost of labor and material, but I mean, assuming that those factors were reasonably constant for both the arsenal and private manufacturers, that the arsenals were not showing any diminution in their economy and ability to manufacture cheaply.

PAYMENT OF PREMIUMS.

Gen. **Crozier.** At one of our arsenals we have now been forbidden by law to offer the encouragement to good work that we had been offering before the passage of the last appropriation bill. I know that in some matters that has operated to increase the cost, and I will have some more data touching that expense before long. I am now referring to the legislation pertaining to the payment of premiums. Aside from that, I do not know that there has been anything to indicate that the economy of manufacture at the arsenals has diminished, and I can put in the hearings, if you like, a good many figures showing that, notwithstanding the rise in the price of material and in the wages of labor, the cost has actually decreased.

There is another matter which has not yet produced its effect, but which will have to produce an effect, and that is that the naval act of the last session of Congress added 15 days to the leave of absence which our employees get annually, so that our labor cost has been relatively increased. I think that it might interest the committee, perhaps, to take a look at that and see what kind of labor-cost handicap we are under. Our employees now by statute get 30 days' annual leave with pay each year, and in addition to that they get 7 legal holidays. That means that they have 37 days' leave with pay. As a consequence of that a workman in one of the arsenals gets about 13 per cent more pay per hour than a workman employed at the same daily wage in a private establishment working only 8 hours per day. If the workman in a private establishment at the same rate of pay per day that our man gets, which is the rule under which we pay them, works 9 hours a day in the private establishment we have to pay 27 per cent more per hour for our work; and that is a very considerable labor handicap.

Mr. **Eagan.** There are a good many plants where they work 9 hours a day now, are there not—I mean private plants?

Gen. **Crozier.** A very considerable number of them work either 9 hours or more. A minority of them work 8 hours.

This labor handicap has just taken effect, and, not having been subjected to it last year, we were still able in many cases to effect economies, notwithstanding the rise in the prices of material and the wages paid labor. I can give you a few instances of that: Currycombs made at the Rock Island Arsenal before last year cost $16 a hundred, and the cost last year was $14 per hundred.

Mr. SHERLEY. For the same currycomb?

Gen. CROZIER. Yes, sir; for the same currycomb. For the Cavalry bridle, model of 1910, the cost before last year was $568 per hundred, and last year the cost was $495 per hundred. The case, complete, for carrying the battery commander's telescope before last year cost $2,015.50 per hundred, but last year the cost was $1,604 per hundred.

Mr. EAGAN. Those are articles that private manufacturers ought to be able to make in competition with the Government and insure to the Government a fair price?

Gen. CROZIER. Yes, sir; they are such articles as ought to be made by private manufacturers and sold at a fair price.

Mr. SHERLEY. In point of fact, there has been a very marked difference as to just such articles in the past, has there not?

Gen. CROZIER. Yes, sir; there has been a very marked difference in favor of the Government. I think in the cases where the difference has been really large it has been because the private manufacturer had not had a great deal of experience. The private manufacturers were somewhat new to the work, and probably made charges that reflected their fear that they might come out with a loss if they did not put the price high.

Mr. EAGAN. It is to be assumed that they have had a great deal of experience in the manufacture of those articles now for European Governments since the outbreak of the European war.

COST OF AMMUNITION.

Gen. CROZIER. Yes, sir; they have had a great deal of experience now, and that reason would no longer necessitate a high price. Now, compartively recently we have called for bids for small-arms ammunition—rifle ammunition—and the price at which we have placed contracts has in some cases been as high as $45 per thousand rounds. We have given two contracts, for one of which the purchase price, with an addition of 6.59 per cent for cost of inspection, amounted to $48.76 per thousand rounds and for the other to $42.99 per thousand rounds. Now, the arsenal cost per thousand rounds, which includes 12 per cent additional for overhead cost, interest, etc., was $39.9 per thousand rounds; so that the purchase price on one was 22 per cent over the contract price.

Mr. EAGAN. Those figures were given at a time when they had plenty of work from European Governments?

Gen. CROZIER. Yes.

Mr. EAGAN. That condition has changed now, according to the newspaper reports?

Gen. CROZIER. According to reports, that is changed now. Now, those costs that I have given for the arsenal are estimated costs for the coming year. They ought to be pretty close, however, because the manufacture of small-arms ammunition is well established, and the cost can be readily estimated, and the material, of course, is bought, and the amount of labor required and the price of it can be readily estimated. Here are some figures on small-arms ammunition costs at the arsenal as compared with the year before. These figures we have do not include the overhead cost, because I am not comparing them with the figures of outside manufacturers, but am simply comparing two successive years at the arsenal itself. During the year immediately past the cost per thousand rounds at the arsenal was $24.32, and during the preceding year this cost had been $22.15. Now, there has been in the interim an increase in the cost of material alone of $3.37 per thousand rounds, so adding that to the cost of the year before would have brought the price up to $25.52 per thousand rounds, as against the actual cost last year of $24.32. So the increase in cost during the year immediately past, as compared with that of the year before, was less than the actual increase in the cost of material, and this notwithstanding the fact that labor had also increased in cost. So, you see, there was an economy in method that was quite considerable.

Now, we have given some orders for powder, and the contract price is less than the arsenal price. You may remember that heretofore the arsenal cost of manufacture of powder for cannon, with the overhead percentage added, has been just under 40 cents per pound, and the contract cost has been 53 cents per pound, which is the statutory price, so the difference was more than 25 per cent of the arsenal cost.

Mr. SHERLEY. You mean by "statutory price" that that was the maximum statutory price?

Gen CROZIER. Yes, sir; the maximum statutory price. Now, this year, the positions have been reversed, and, as I said a moment ago, the contract prices are less than the estimated arsenal cost.

Mr. SHERLEY. For cannon powder?

Gen. CROZIER. Yes, sir; for cannon powder. The reason for that is the fourth reason I gave a moment ago, in my opinion, and that is that these private manufacturers have executed such tremendous orders for European governments that they can regard their plants as no longer a burden, but as something which has been entirely paid for, and they do not have to charge anything for them. The average price which we are paying now under contract for cannon powder, including 6.59 per cent increase for cost of inspection, is 55.4 cents per pound, and the average estimated cost of manufacture at the arsenal for this coming year is 57.3 cents, which includes the overhead not paid out of the appropriation of 19 per cent for interest, depreciation, etc. In the year immediately past, we made this powder at the arsenal, including the same overhead percentage charge, for 46.1 cents per pound. The increase in the estimated cost is due to the increase in wages, and also to the marked increase in the price of material. For example, for mixed nitric and sulphuric acid, which is used, the price has risen from 3.1 cents per pound, to 6.64 cents per pound, that is, it has more than doubled. For fuming sulphuric acid the price has increased from 0.725 cent to 1.225 cents per pound—that is, during the year, and the present market price is anywhere from $5 up. Alcohol has increased in price from 4.6 cents to 7.9 cents per pound, while diphenylamine, which is the substance we put in for increasing the keeping qualities of powder, has increased from 22 cents to $1 per pound. Cotton has increased from 6 cents per pound to 7.8 cents per pound. Those are the reasons why the prices have gone up.

Mr. SHERLEY. General, if you get the money you are asking for under this item, do you expect to be able to place the orders for that amount of material?

Gen. CROZIER. I have not had anything thus far to indicate that it can not be done.

Mr. SHERLEY. And, of course, when I say "this amount" I also assume you expect to spend the amount you are asking in the Army bill.

Gen. CROZIER. Exactly. We will have to call on the private industries of the country for more work than we are calling on them for now, but I think they will be able to do it, and thus far in this field material, although there have been some cases in which the bids have been beyond the prescribed limit, there have been some other bids that have not been beyond the prescribed limits which I have been able to accept, but I would rather not have the limit there. It is sometimes embarrassing. I will give you an instance which is in reference to a later item in this same bill, but might as well be mentioned now while we are on the subject of this limit.

The sea fights in the present war have drawn attention to the fact that naval vessels will shoot at one another, at least, at longer ranges than have been employed before, and at longer ranges than our seacoast guns have been able to attain with the limit of elevation imposed on them by the mounts. Among the methods for meeting this promptly I have advanced the mounting of some spare 12-inch guns which we have upon carriages permitting elevation as high as 30°. My office has been industriously at work on the design. We have produced the design and we have given orders for manufacture. We have got some of the carriages fairly well along in manufacture, and we have given Watertown Arsenal as much work of manufacturing that type of carriage as it can turn out in the next 15 months. Now, I had funds for some more, and we advertised for nine more of these carriages. I got three bids. One was from an establishment which, I fancy, did not expect an award, and was for $232,620 a carriage, which is pretty nearly five times as much as the arsenal cost, which was $56,719 a carriage, this arsenal cost including the usual overhead percentage. Twenty-five per cent added to the arsenal cost would give $70,898.

I got one bid that was just within that sum, and therefore, as far as the limitation is concerned, must have accepted it; but the proposed date of completion for these carriages, which we wanted as an early method of meeting the demand for increased range, was 32 months for nine carriages. The other bid gave an estimated date of completion of 23 months, but that was at a price of $82,686 apiece, which was nearly $12,000 more than the 25 per cent advance over the arsenal cost, and therefore could not be accepted. Now, that is the situation with regard to those carriages. We want those carriages very badly. I have tried to get another manufacturer to make an offer independently, which would be within the limitation, but after taking it up and looking into it a little he concluded he could not make an offer, and we have not yet succeeded in getting anybody to build those carriages within a reasonable time.

AMMUNITION FOR MOUNTAIN, FIELD, AND SIEGE CANNON.

Mr. **Sherley**. General, the next item is:

> For purchase, manufacture, and test of ammunition for mountain, field, and siege cannon, including the necessary experiments in connection therewith and the machinery necessary for its manufacture at the arsenals, etc.

You are asking for $11,300,000, with a contract authorization of $2,000,000 additional. Last year you obtained $6,000,000 in cash and $3,000,000 in contract authorizations?

Gen. **Crozier**. Yes.

Mr. **Sherley**. What is the condition of your balances under this item?

Gen. **Crozier**. The Treasury balance on December 9 was $6,434,201.78, and there was due under contract made or orders for manufacture given $6,168,739.23, leaving an unobligated balance of $265,462.55. Of the $3,000,000 contract authorization given in the last act, everything has been obligated except $155,500.

Mr. **Sherley**. What have you done with this money?

Gen. **Crozier**. We have under manufacture, under orders given to the Frankford Arsenal, approximately 790,000 rounds to be paid from the funds appropriated at the last session. These orders will occupy the capacity of the Frankford Arsenal on a two-shift basis until next October. They entail also the purchase of finished components of ammunition to the value of five and a half million dollars. Now, including this five and a half million dollars which has to be paid for components, the cost of the ammunition, including other material, and including labor and all other charges which have to be paid for out of the appropriation at the Frankford Arsenal, will be $12,500,000. There remains, then, from the appropriation, in addition to a reasonable working balance which is to be expended in purchases of ammunition, $6,500,000, which will be sufficient to procure about 411,000 rounds of various sizes.

Mr. **Sherley**. General, how much did you get in the Army bill last year?

Gen. **Crozier**. That statement relates really to three appropriations, the one which is made in this bill, the one for the ammunition for the National Guard made in the Army bill, and the one for target practice for the Field Artillery, which is made in this bill; and a fourth appropriation should be added to that for target practice, which was made in the deficiency bill of last year. The appropriations and authorizations made in this bill were $9,000,000, the one that was made in the Army bill for ammunition for the National Guard was $10,000,000; and for target practice, in both this bill and the deficiency bill, the sum appropriated was $1,118,000. All those added together make $20,118,000, and the items which I have just given you, $12,500,000 and $6,5000,000, amount to $19,000,000.

Mr. **Sherley**. So you expended or will have expended about two-thirds of it for manufacture in the arsenals and one-third for private manufacture?

Gen. **Crozier**. The orders which I have given to the Frankford Arsenal, which contemplate what might be called manufacture, are, as I said before, $12,500,000. Now, for that manufacture they have to purchase material, and it is not always easy to draw the line as to what material is; for instance, in a round of shrapnel ammunition we know what that round is complete, namely, the cartridge case and the shrapnel case of steel and the fuse and its various parts and the powder and the bullets, etc. Now, of components which do not themselves have to have any further work done on them except assembling, as distinguished from other kinds of components which have to have machine finishing done on them at the arsenal, there will be purchased from that $12,500,000 $5,500,000 worth. It is further to be noted that there is not included in that as finished components the powder that goes into the ammunition or the explosive for the bursting charge which goes into some of the ammunition, although those two things themselves might be said to be finished components, because no work has to be done on them, particularly, to finish them. The last item amounts to $1,500,000, which would leave out of the $12,500,000 about $5,500,000 worth to be expended at the Frankfort Arsenal in labor and in material which will have to have some work done on it.

Mr. SHERLEY. So that in point of fact a little over 25 per cent is being done in the arsenal and 75 per cent in the way of purchases from private manufacturers, either of finished product or of the finished components?

Gen. CROZIER. Yes; that is correct.

Mr. SHERLEY. General, last year you testified that for the 225 batteries which were actually in existence or had been provided for, we had ammunition amounting in value to about $13,000,000, and that it constituted 60 per cent of the Grebble Board allowance for those batteries and only about 29 per cent of the Grebble Board allowance for the new scheme, or what we designate as the Treat Board scheme. Can you state now what proportion of the Grebble Board allowance of ammunition has been appropriated for and is either in existence or moneys available for it?

Gen. CROZIER. I have not the figures here relating to the ammunition alone, but with reference to the whole project, including ammunition, guns, carriages, and all other material, I can say that out of the total estimated cost of that Grebble Board project, amounting to $69,879,000, everything has been provided for except to the value of $2,515,000.

Mr. SHERLEY. So that broadly speaking there is provided in value guns and ammunition equal to what was contemplated under the Grebble Board's scheme?

Gen. CROZIER. Yes, sir.

Mr. SHERLEY. Now what is the money value of the ammunition we have now provided or have appropriated for?

Gen. CROZIER. For the Regulars and Volunteers and insular possessions, which are provided for in this bill, the money value amounts to $15,500,000, and the amount remaining to be procured, which is appropriated for in this bill, is in value $62,500,000. The value of the ammunition for the National Guard which is now on hand or appropriated for is $17,650,000, and that which remains to be procured for the National Guard in value is $74,350,000. Therefore the percentage of the amount of ammunition for the Regulars now on hand or provided for is 20 per cent, and for the National Guard it is 19.2 per cent.

Mr. SHERLEY. Or roughly speaking, for the whole scheme we have about one-fifth?

Gen. CROZIER. That is correct—either on hand or appropriated for.

Mr. SHERLEY. You are asking this year in two bills for how much money?

Gen. CROZIER. Including the authorizations asked for, $25,500,000?

Mr. SHERLEY. That will raise the percentage to what point, in the event that it is allowed in its entirety?

Gen. CROZIER. It will increase the percentage between 11 and 12 per cent.

Mr. SHERLEY. So that it will be a little less than one-third of the total in the event that these estimates are allowed?

Gen. CROZIER. Yes. The approved project contemplates providing for the remaining mobile artillery material and ammunition with seven additional annual appropriations. On that basis this year's estimate for ammunition, under the heading we are discussing, would be $8,900,000, plus $3,000,000 to cover the contract authorization in the last fortification bill. But we have added 15 per cent to that $8,900,000 to cover the increased cost of labor and material in this class of article, making the amount asked for $13,300,000, which equals the cash appropriation and the contract authorization, which I am asking for under this item.

Mr. SHERLEY. General, laying aside the question of the percentage of ammunition we have on hand, what have you to say touching the desirability of appropriating this much money at this particular time for this purpose?

Gen. CROZIER. I think it contemplates the accumulation of a supply certainly no more rapidly than it ought to be accumulated. I think it can be expended; that is to say, I think that the munitions factories of the country can turn out the ammunition called for, and, under the circumstances, it seems to me it would be a wise appropriation.

RESERVE AMMUNITION.

Mr. SHERLEY. Last year you, as well as other officers, testified to the fact that the disclosures in the European war had served only to accentuate the conclusions reached as to the needs of much greater quantities of reserve ammunition than had ever been contemplated as necessary in the years that have gone by. Do you still share that view?

Gen. CROZIER. Yes; I still share that view. I might add that as between the large and small calibers I have not heard any thing since I was last before the committee to modify my view that we are not yet ready to embark upon a supply of the very large calibers of field pieces, with their ammunition. I am speaking now of field pieces of greater than 9.5 inches in caliber. What I have heard recently particularly confirms me in the view that even on the western front, where the mobility of artillery is not very important, the particularly useful pieces have been those of about 6-inch calibre and those of about 9.2-inch caliber, both of which provided for in our approved project.

With reference to the general subject of the value of field artillery in such a war as is going on in Europe there are, perhaps, two kinds of fighting going on over there. There is the trench warfare on the western front and there is the more open warfare on the eastern front. and particularly much more open warfare now on the southeastern front, in Roumania. With reference to the western front the most considerable operations that have taken place there since I was last before the committee are the assault at Verdun of the Germans on the French and the assault in the region of the Somme of the French and English on the Germans, both being, of course, more properly a great series of assaults rather than—in each case—a single assault. It is claimed on behalf of the English and French allies that they are producing a greater effect upon the Germans, aside from the mere gain of ground, which is slight, than they are suffering themselves by this effort that they are making in the region of the Somme. When the question is asked as to why the conditions are apparently reversed as compared with what they were at Verdun, when it was claimed, in behalf of the same side, that the assailants were suffering more than the assaulters, the answer is made that the difference is due to the method of attack in the Somme region, and particularly to that part which is played by the artillery, the claim more in detail being that the gains in the region of the Somme are made by artillery fire, and that they are consolidated and made good by the occupation of trenches, whose defenders have been killed, wounded, or demoralized by the artillery and the subsequent occupation by the infantry; that is, of the trenches whose defenders have been claimed to have been either killed, wounded, or demoralized by the artillery fire.

The reason for the great effect of the artillery fire in the Somme region has been claimed to be, first, a superiority in artillery which the allies now declare—or it is declared in their behalf—to exist: and, second, because of the superiority in the air, which is claimed on behalf of the allies to exist, by reason of which the fire of the artillery of the allies against the Germans can be profitably directed, whereas because the Germans are alleged to be kept out of the air by the fire of their artillery is inferior and can not be effectively directed. So that the latest phase of the war on the western front leaves the artillery in the position of importance which the general estimate gave to it at the time I was last before the committee.

Mr. Sherley. Have you any information as to the character of artillery being employed by the allies in their assaults on the Somme?

Gen. Crozier. As I stated a moment ago, the best information that I get—which has more or less hearsay in it at its source, at least—is that the important pieces there are the 8-inch and 9.2-inch gun, or about those sizes.

Mr. Sherley. They are [illegible] the French?

Gen. Crozier. Well, they are considered more important in hammering the trenches. When any of these troops get out of the trenches or get in motion they are peppered, so to speak, with 3-inch [illegible] effect on the personnel. But [illegible] effective against the strong [illegible] western front. There [illegible] this war, who are saying [illegible] again that the [illegible] importance, which it [illegible]

Mr. SHERLEY. I noticed in the paper the other day a statement to the effect that one of the positions of the Roumanians, I think it was, had been abandoned or its ambandonment had been made necessary largely by virtue of the fact that the central allies had guns of more powerful character and longer range than the Roumanians had. Do you know just the character of artillery that is playing the chief part in the fighting on the eastern front and on the southeastern front?

Gen. CROZIER. I do not know. I do not think there is any reason for believing that the Roumanians have any very great supply of artillery, of what used to be called heavy caliber field artillery, but which now we speak of as the midcaliber of field artillery; I am now speaking of about 6-inch caliber. I do think, however, that there is evidence that the retirement of the Roumanian Army is due to lack of ammunition and, in all probability, to lack of artillery ammunition. The retirement of that army has been so rapid that there does not seem to be a possibility of much fighting having been indulged in—I mean the retirement which has taken place within the last few weeks. Neither the retiring force nor the advancing force could move as rapidly as those armies have moved and do any fighting. Therefore, it seems apparent that the Roumanian Army is simply getting away, and the most plausible reason for that is that they are getting away because they lack the means with which to make a stand, I think a lack of either equipment or ammunition.

Mr. SHERLEY. Or numbers?

Gen. CROZIER. Well, even if they lacked numbers they could delay the advance of the other army more than they have delayed it. The advances have been as rapid as our Infantry can advance when there is no fighting going on at all.

Mr. SHERLEY. I noticed what purported to be an interview with Gen. Hindenberg in which he was asked touching the character of fighting and the lessons to be drawn from it, particularly as they relate to America, and the interview purports to quote him to the effect that the situation in America, with the very great territory that exists here, makes it extremely improbable that there would ever be fighting here similar in character to the trench warfare on the western front, the massing of great numbers of men within restricted areas, and that it would be a mistake for this country to conclude that the kind of warfare that has been developed on the western front was what this country should prepare for, but that more mobile movements on the part of the respective armies would likely prove to be the fact. That is the view that you and some of the other officers have given expression to, I believe, in the past. Do you still hold to it?

Gen. CROZIER. Yes. I see no reason for departing from that view. I tried to express that view to the committee without dogmatism. I know that there have been supplied pieces of quite heavy caliber on the western front beyond the 9.2 which I have mentioned. For instance, I am assured, in such a manner that I believe it, that a comparatively small number, a dozen or 15, of howitzers of 15-inch caliber have been supplied to the British forces, but it has been reported to me that the British officers say that they are not particularly useful in the state of warfare as it now exists, but that they expect to use them when it comes to an assault on Metz or some such place as that. When I said my information had some hearsay in it at its source, I meant that it comes to me through channels that can not properly be called hearsay channels, but it is oftentimes in the form of the report of the opinions of individual officers on the other side who are in these armies which are contending, and which opinions might not be shared by every other officer there.

Mr. **Sherley.** General, I assume that inasmuch as the proportions are the same as to ammunition and as to guns—that is, of the total scheme—that they are bearing a correct and proper relationship to each other; or, in other words, that as we provide funds for the guns we are, to the same extent, providing ammunition for them.

Gen. **Crozier.** I can give you a little bit more definite statement on that point, although your understanding is substantially correct. The statement that I would make is as follows: The ammunition which has been appropriated for up to the present time is sufficient to provide the established allowance for the artillery which has been provided for and which will be completed before January 1 next. and the estimates which I am now submitting to you will be used to provide the allowance for additional batteries, both Regulars and National Guard, already appropriated for, but which will not be completed until after January 1. The statements I have just made relate to batteries and ammunition for both the Regulars and National Guard, and therefore cover the estimates submitted with reference to both bills. That it to say, the estimates will complete the allowance for the batteries which have already been appropriated for, but which batteries will not be completed until after January 1 next. So that the batteries which I am now asking to be appropriated for will not have any ammunition procured from any of the funds which have already been authorized or which I am now asking to be authorized.

Mr. **Sherley.** You will require but seven appropriations for both guns and ammunition to finish your scheme?

Gen. **Crozier.** We have heretofore been behindhand with our allowance of ammunition for all calibers, large as well as small. We are now catching up with our allowance. Most of the batteries which we have had provided for have been of the smaller calibers. As we go on the batteries will, in larger proportion, be of the larger calibers, for which the ammunition is much more expensive. As the matter stands now the estimate of funds which I am asking for will balance the artillery which has already been appropriated for, mainly as a coincidence at this stage.

Mr. **Sherley.** But if you continue presumably you will finish the artillery and ammunition at the same time?

Gen. **Crozier.** Approximately at the same time, but, as you can see, if we follow the rule absolutely of appropriating one-seventh for each until the project shall be completed the ammunition project will be completed before the artillery project, because the last appropriation will be the last seventh of ammunition and the last seventh of artillery material, and the ammunition can be finished more quickly.

Mr. **Sherley.** But there will be only that difference?

Gen. **Crozier.** Yes.

Mr. **Sherley**. You had to submit additional amounts over the Treat Board's figures for the material desired, owing to the increased cost of material and of labor?

Gen. **Crozier**. Yes.

Mr. **Sherley**. In view of that fact, is it desirable now to press forward this work or might it not be in the interest of economy to go a little slower and, perhaps, have larger appropriations than one-seventh in some of the future years?

Gen. **Crozier**. Purely from the point of view of economy, I think that in all probability we will be able to get more for our money a few years hence than we can now, but inasmuch as we are contemplating seven years for this program and only getting one-seventh now, I think that in the beginning of our program, when we are shorter than we will be at any other subsequent time, we had better endure the higher prices.

Mr. **Sherley**. Do you think they are going to be at all offset by virture of the increased capacity of private manufacturers at this particular time and, presumably, the keener competition which might arise for contracts?

Gen. **Crozier**. I think there will be; yes, sir. And I can say also that we have found, in placing orders for components for artillery ammunition, out of funds which you appropriated at the last session, that we met lower prices than we expected to meet—not lower than we got before, but——

Mr. **Sherley**. Lower, considering the increased cost of materials and labor?

Gen. **Crozier**. Yes, sir. So that we were able to place at the Frankford Arsenal orders calling for the $12,500,000 which I spoke of a while ago, which orders we had expected would call for about $15,000,000.

INCREASED CAPACITY OF ARSENALS.

Mr. **Sherley**. When we were talking about the artillery it developed that most of the increase in the capacity of the arsenals to be effected by virtue of appropriations made for that purpose last year related to material other than that, and presumably, in considerable measure, to ammunition. What is the situation now touching the work that you have in the arsenals in the way of making ammunition, and to what extent, if at all, will their capacity be increased, or has it been increased by virtue of those appropriations?

Gen. **Crozier**. The Frankford Arsenal, our principal field artillery ammunition factory, and the only one except for certain components, at present has orders that will tax its capacity on a two-shift basis until next October. Now, the principal governmental increase of capacity in field artillery ammunition in contemplation is the plant to be erected at the Rock Island Arsenal from the appropriation of $1,250,000 which was made at the last session. That plant has not, so far, gotten beyond the planning stage. I have informed the commanding officer of the arsenal in some rather voluminous correspondence what is expected; have sent him around on a visit to various artillery ammunition factories, rather hastily; and I have caused him to designate the officer of his staff whom he would have particularly in charge of this expansion; and I have sent him around to make a more extended visit to various field artillery ammunition plants.

That has been completed. Those officers have drawn up and told me, to a certain extent, what character of plant it is expected to be established there, and we have selected its location at the arsenal. We are now engaged in negotiations with engineering firms for the erection of the plant. The detailed work of the design, erection, and inspection of this plant is beyond the capacity of the officers whom I have at Rock Island—that is to say, it is beyond their capacity in numbers—because I have not enough officers there to be able to put the necessary number upon this work. Therefore what we propose to do is to have an engineering firm in close consultation with the arsenal officers to design in detail this plant and supervise its erection. We are in consultation with such a firm and we are endeavoring to arrive at an agreement which can be lawfully entered into. There are some questions in the way.

The first question is as to whether we can employ such a firm or corporation by selection and without advertising for competition between certain firms. The difficulty about advertising for competition would be that we would have to specify with so much particularity what we want them to compete on that we would not be spared the labor we want to be spared. Then, the next question is if we could employ, without throwing it open to competition, this engineering firm or corporation to prepare plans and estimates and specifications, can we employ them, also without competition, to erect the buildings; that is to say, to give their services in this work, make contracts for material, and employ workmen? I do not think there is much difficulty in arriving at the conclusion that we can not do all of that, because when it comes to the procurement of material for buildings, for instance, and machinery, and other equipment, there must be competition. We can not avoid the statute, which requires such competition, by employing somebody else and letting him go and purchase the material. We must in some way get competition on that.

So it comes down, then, to the question of what we can employ them to do. We can employ them to furnish the labor for the erection and the equipment of the plant; employ them to prepare the plans, specifications, etc.; and then we can get the material, the material being procured in accordance with the statutes governing competition. We can employ them to employ the labor for the erection and inspection of the plant; but then there comes the question of whether that labor must be employed through the Civil Service Commission from the list of eligibles of the various trades and occupations, including bricklayers, engineers, inspectors, and people of that sort. So that is another question that has to be settled. You can see, therefore, that there is a good deal in the matter besides simply making up our minds what kind of plant we want and getting somebody to put it up. This appropriation was not made until last summer, and we have not had the time, with all the other work we have had to do in consequence of those appropriations, all of which passed rather late, to go further along with those plans than I have indicated.

Mr. SHERLEY. Now, there were some enlargements that did not involve any new plant, but which involved simply the purchase of additional machinery and the erection of various workshops, by which it was expected to greatly increase the capacity for particular kinds of work.

Gen. CROZIER. Yes, sir; there were appropriations for an increase in the capacity of the Frankford Arsenal along various lines. They were not projects of such magnitude as to call for the employment of an engineering firm or corporation, and they are proceeding. The buildings are being erected and the equipment is being procured.

Mr. SHERLEY. What I am trying to get at is not so much a detailed statement touching the expenditures of those funds that were given to increase the arsenal's capacity, because that would more properly come up when we reach the subject of the arsenals in the sundry civil bill, as to find out somewhat the situation that is going to confront you touching the expenditure of the money you are now asking for ammunition. These moneys are to become immediately available.

Gen. CROZIER. The appropriations in this bill; yes, sir.

Mr. SHERLEY. So they would become available between this and the 4th of March. Now, I presume from what you have already said that, speaking by and large, you will not have grown very materially in capacity at the arsenals when you first begin to spend this money.

Gen. CROZIER. I think it doubtful if I shall get any help from the increased capacity of the Rock Island Arsenal in the expenditure of the funds which are estimated for now, but I do think that we will get some help from the Frankford Arsenal in the expenditure of these funds.

Mr. SHERLEY. Now, you are asking for $25,000,000, practically, for mobile artillery ammunition. What proportion of that sum, if you can roughly state it, do you expect to expend through the arsenals and what proportion outside? Of course, it will be very greatly as to the different components of the ammunition, but, lumping them, have you any basis upon which you can arrive at a rough estimate?

Gen. CROZIER. I can say that it can be gathered from the statements I have already made about the capacity of the principal munitions factory that of the funds I am asking for now approximately one-fourth, but probably something less than one-fourth, will be expended in the Government factories, and that the remainder will be expended in the purchase under contract of either finished rounds of ammunition or finished components of rounds of ammunition, which components will not require any work done on them afterwards in order to use them.

Mr. SHERLEY. One of the components of this ammunition, of course, is powder?

Gen. CROZIER. Yes, sir.

POWDER FACTORY.

Mr. SHERLEY. I have forgotten just what percentage in value it represents, but, roughly, I think it is about 10 per cent. A few years ago we were making all of the cannon powder we needed, but the very great increase in appropriations produced a condition whereby that was no longer possible, and in order to somewhat meet that situation Congress last year appropriated $500,000 for the erection of a new powder factory. Have you been able to spend that money or erect that factory?

Gen. **Crozier.** The percentage you mentioned is nearer 20 per cent. With reference to the new powder factory we have not taken any steps toward the erection of that factory as yet, for the following reasons: It was found upon examination that the sum appropriated would not provide for the complete erection of a powder factory of economical capacity, and the appropriation did not require that it should be used for the complete erection of such a powder factory, but authorized the enlargement of the existing powder factory. Of course, a very material and very serviceable enlargement of the present powder factory could be made with the sum appropriated. But I did not like to invest any considerable sum of money in increasing the size of the present powder factory because it is in the wrong place. It is near the Atlantic seaboard where it is too much subject to attack, and I think, for that reason, that it should be, at least, behind the Allegheny Mountains. Then, in order that the factory to be erected with the sum appropriated should be of economical capacity, it would be necessary to erect it in connection with some other plans which the Government either has or expects to have. If there were no such plan, I should probably submit the matter to the committee a second time, but, as you know, a large sum of money, $20,000,000, was appropriated at the last session of Congress for the erection of a nitric-acid plant, and I have thought, from all points of view, both because of the considerations I have just been mentioning, and also because of the convenience of manufacture which would exist, that, if there were no question of the amount of money involved, this new powder factory appropriated for ought to be located at the same place with the nitric-acid factory. Therefore, I wrote a letter to the Secretary of War and placed that situation before him, and stated that, in my judgment, steps for the expenditure of this money should not be taken until after the location for that nitric-acid factory had been selected, which has not been done.

NITRIC-ACID PLANT.

Mr. **Sherley.** I gathered from your report, as well as from the report of the Seccretary of War, that the matter of the location of the nitric-acid plant was awaiting first a determination as to the most desirable process to employ in the manufacture of nitric acid, and that that matter had been referred to the National Acadamy of Science for investigation and report. How soon do you expect that a decision as to the character of manufacture of nitric acid will be arrived at?

Gen. **Crozier.** I expect a report from the academy this month. The National Academy of Science appointed a committee for the consideration of this subject, which committee was taken from its own membership and from the membership of the American Chemical Society. It is a good committee, and I think that committee will report this month. Now, with reference to the time at which a decision can be arrived at after the receipt of that report, I am in hopes that it can be made quickly, because I think that one question that can be answered quite promptly after the receipt of that report is whether the process to be employed ought to be one which ll involve a considerable water power. That question can be answered while still leaving open the question as to the particular process necessary to be employed, and if that question is answered n the affirmative, that is, that water power will be necessary, then e site can be selected and the development of the water power can commenced, and it ought to be the case that before that water ower shall be ready for utilization all question as to the particular rocess to be employed shall be settled.

Mr. **SHERLEY.** Then, with the solution of that problem, you contemplate the determination of the location of the powder plant?

Gen. **CROZIER.** Yes, sir.

Mr. **SHERLEY.** In view of the statement you made a while ago t the estimated cost of your making powder now, due to the eatly increased cost of the components, was equal to or in excess f the price at which you were obtaining it by contract, the Govnment will not suffer the financial loss by the delay that would ve been true a few years ago when we were making powder for mething over 40 cents per pound and buying it at 53 cents per nd.

Gen. **CROZIER.** That is true, Mr. Chairman. Because of the adntage which these private manufacturers now have from their rge transactions and from having their factories paid for, as g as they will give the Government the benefit of that in the e, the Government will not suffer any loss from not manufacring more of its own powder.

Mr. **SHERLEY.** Do you pay 53 cents per pound for powder now?

Gen. **CROZIER.** Yes, sir; we are buying some at 53 cents per pound w. We have made three contracts for cannon powder recently, e for 53 cents per pound, one for 51 cents per pound, and one for cents per pound. I said a little while ago that the average price ich we were paying for this cannon powder was 55.4 cents per nd, but that includes 6.59 cents for cost of inspection. Those res I have just given you represent the actual prices bid by the tractors. One of those contractors made a bid of 50 cents per nd provided he could have the whole order.

Mr. **SHERLEY.** Was that the Du Pont Co.?

Gen. **CROZIER.** Yes, sir.

Mr. **SHERLEY.** Who were the other people?

Gen. **CROZIER.** The three companies from whom we have had bids the Du Pont Co., the Hercules Powder Co., and the Aetna Exsives Co.

Mr. **EAGAN.** General, is the necessity for the building of this Govment plant just as great now as it was at the time provision was le for it?

Gen. **CROZIER.** No; I do not think so. At the old prices there ld have been an advantage in building it, in that we could make wder cheaper than we could buy it; but just now, as we can buy it heaply as we can make it, and more so, and as there is no end of acity in the country, it does not seem to be necessary, and the vernment, at least, is losing nothing by not running it.

Mr. **SHERLEY.** The necessity or advisability, however, will be somet dependent upon future facts as to whether you can buy as iply, and whether the particular condition that makes your own t of manufacture expensive and at the same time permits a rather cheap price, relatively, to be obtained from private manufacturers may or may not then exist.

Gen. CROZIER. Yes; that is true.

WEDNESDAY, DECEMBER 13, 1916.

PURCHASE, MANUFACTURE, AND TEST OF SEACOAST CANNON, UNITED STATES.

Mr. SHERLEY. General, the next item is "For purchase, manufacture, and test of seacoast cannon," etc. Before going into the appropriations for last year and the estimates for this year I believe you testified last year that all of the appropriations necessary for the work on the guns that were to go to San Pedro had been made, and that that work ought to be completed along about June or July of 1916?

Gen. CROZIER. Yes.

SAN PEDRO.

Mr. SHERLEY. What is the fact touching the physical condition of this armament for San Pedro?

Gen. CROZIER. When I last appeared before the committee there were certain items of the armament which had not yet been completed. They were as follows—and this is the present stage: Eight 12-inch mortars and their carriages had not been completed. They have now all been completed and shipped and are at the fort. Four 14-inch guns on disappearing carriages had not been completed. Two carriages have been completed and shipped. The remaining two carriages, with their two guns, have been completed, and are being held in store awaiting the completion of the emplacements, and the other two guns will be shipped this month. Four 3-inch guns and their carriages have been completed and are in store at the Benicia Arsenal awaiting the completion of the emplacements.

Mr. SHERLEY. Were all those for San Pedro?

Gen. CROZIER. Yes.

SAN DIEGO.

Mr. SHERLEY. How about the carriages for San Diego? Are you not building some of them?

Gen. CROZIER. I think not.

Col. WINSLOW. The San Diego mortars are to be taken from the older fortifications.

Mr. SHERLEY. I knew the mortars were, but I had the impression the carriages were not.

Maj. EMBICK. The carriages also.

Gen. CROZIER. There was a shifting there and no new manufacture.

Mr. SHERLEY. You have, then, actually completed, although they have not been emplaced and turned over to the Artillery, all of the guns and mortars, including their carriages, for San Pedro?

Gen. CROZIER. Yes, sir.

Mr. **Sherley.** You are a little later than you figured on.

Gen. **Crozier.** I have not said just how late I am or when they were completed. They are completed now.

Mr. **Sherley.** The result, then, is that it is only a question of a few months until this fortification will be completed and turned over to the Artillery?

Gen. **Crozier.** I think so; but that depends on the progress of the engineering work.

Mr. **Sherley.** We understand from former testimony that they are practically ready to receive the ordnance, and you are now ready to supply the guns and carriages?

Gen. **Crozier.** Yes; the armament is ready.

Mr. **Sherley.** You had a balance last year of fifty-three thousand eight hundred and odd dollars. How did you actually come out as to the cost of these guns and carriages? Was that balance added to or reduced?

Gen. **Crozier.** The cost of those which had been previously provided for?

Mr. **Sherley.** Yes.

Gen. **Crozier.** I think we finished that in accordance with the estimate, and the balance we reported as having I think we were able to utilize for other things to which it was applicable.

Mr. **Sherley.** I was not asking as to whether you had the cash; but when you stated you had an unallotted balance of $53,855, there was still work being done and to be done on these guns and carriages, and I was simply making inquiry as to whether the completion was within the allotment you had made or whether you made some saving or ran over a little.

Gen. **Crozier.** The completion was within the allotments I had made and there was a slight saving. We did not have to draw on any of the balance I told you we had at that time, and it was increased a little bit by the work upon final completion not having cost as much as we had allotted for it.

Mr. **Sherley.** Last year you asked for $1,764,500 and for a contract authorization of $3,000,000. Subsequently, by virtue of some statements that came out in connection with the hearing, it was indicated that that cash estimate might properly be cut, and you received $1,284,000 with a contract authorization of $3,000,000.

Gen. **Crozier.** Yes, sir.

Mr. **Sherley.** That was to undertake, as I recall, the building of 24 antiaircraft guns with their mounts; four 6-inch guns on disappearing carriages; 17 barbette carriages on which to mount 12-inch guns; and one 14-inch gun mounted on a railroad car, and one 16-inch howitzer mounted on a railroad car; six 16-inch guns on disappearing carriages; and to do some work on a turret for two 16-inch guns; is that right?

Gen. **Crozier.** Yes, sir.

Mr. **Sherley.** How much of these moneys have you expended and to what extent have you used the authorization?

Gen. **Crozier.** I found that the funds appropriated and authorized were not sufficient to carry out that project and therefore I have had to submit an additional estimate for part of it. The shortage was in the amount necessary to cover the four 6-inch guns and their carriages, which you have just mentioned; 5 of the 17 barbette carriages for 12-inch guns and a portion of the work, namely, some $400,000 worth, which we had expected to put on the turrets, to the extent of $417,500, owing principally to greater costs than we had anticipated.

Mr. Sherley. Was that true both as to the arsenal costs and the contract prices?

Gen. Crozier. It was principally in the contract prices. For instance, the 12-inch barbette carriages which we had estimated at $55,000 apiece were bid for by the lowest bidder at $69,875 apiece. The arsenal estimate is still no greater than the estimate I had made; in fact, it is a little less. The estimate I had made and upon which I based my request for funds was $55,000 for each one of those carriages, and the present allotment cost to the arsenals plus 18.66 per cent is only $56,719.

Mr. Sherley. And what was the bid price?

Gen. Crozier. The lowest bid was $69,875. The next bid was $82,686, and as I explained yesterday in connection with another subject the low bid was for a very long delivery. The next bid also was r a **long delivery, considerably** longer than we are contemplating at the arsenal.

Mr. Sherley. Were these contracts let?

Gen. Crozier. They were not; no, sir. Nine of these carriages, the funds for which are appropriated under this item and under other items and under other bills have not yet been ordered. I am still seeing what I can do with reference to the procurement of those carriages. The situation is this: The low bidder, whose bid we have, comes within the 25 per cent limitation imposed by the law, comparing the contract price with the arsenal price, but the time is so long that although there is nothing statutory in regard to that I think it is not reasonable. We do not want to wait so long, if we can help it. Now the time in the next bid, which is nine months shorter, is accompanied by a price which is not within the statutory limits.

Mr. Sherley. General, you have allotted, I presume, all of this money?

Gen. Crozier. It is practically all allotted. Here is the condition of the Treasury balance: On December 9 it was $1,137,474.63, of which there was obligated by contract and orders already placed, $945,297.22, leaving an unallotted balance of $192,177.41; but we know just what we want to do with that unallotted balance, so that it is not free.

Mr. Sherley. Then in point of fact you are asking for an additional appropriation of $996,000 in order to do this work?

Gen. Crozier. Yes; that is to be applied on the program of last year.

Mr. Sherley. That appears as a supplemental estimate, found in House Document No. 1714, Sixty-fourth Congress, second session.

Gen. Crozier. Yes, sir.

Mr. Sherley. And you have already stated, I believe, the causes that make necessary this additional appropriation?

Gen. Crozier. Yes, sir.

Mr. SHERLEY. You mentioned a number of pieces of work that could not be completed under the old estimate. Are we to conclude that only on those pieces which were mentioned has there been an increased cost; or has there been an increased cost in doing all the work and therefore there was not available to the extent of $996,000 the money necessary to do the work?

Gen. CROZIER. The increased cost has come in on all of the work.

Mr. SHERLEY. So that if the $996,000 should be appropriated, it, together with moneys heretofore appropriated and contract authorizations heretofore made, will take care of the work that was enumerated last year.

Gen. CROZIER. Yes. I should say, however, instead of including—to make it a little clearer—in addition, because they were not included in the program of last year.

Mr. SHERLEY. Yes; I understand that.

Gen. CROZIER. I am considering now accurately what you have just said—that is, the program as laid out last year—because it was laid out last year that certain of the projects then appropriated for with authorizations for contracting obligations would not be entirely covered by the sums appropriated and authorized, and that situation still remains.

Mr. SHERLEY. Last year the statement was that the estimate would complete the enumerated guns and carriages and do some work on the turret for two 16-inch guns.

Ge. CROZIER. Yes; and also that it would do a good part of the work on the Rockaway Beach project, did it not?

Mr. SHERLEY. I find in reading over the testimony that it did not contemplate the completion of the Rockaway Beach project, and some of the guns that I have spoken of were intended for Rockaway Beach, so that in point of fact it was not contemplated that you would finish all of the guns and carriages I have enumerated. Perhaps it would be made clearer by my reading what was in the program and my understanding as to what was to be finished, and in the event I am mistaken at any point you can correct me. There were 54 antiaircraft guns. They were to be entirely provided for out of the funds estimated for last year.

Gen. CROZIER. Yes.

Mr. SHERLEY. There were four 6-inch guns on disappearing carriages; and that was true as to them?

Gen. CROZIER. Yes, sir.

Mr. SHERLEY. And there were 17 barbette carriages on which to mount 12-inch guns for long-range fire; and that was to be true as to them?

Gen. CROZIER. Yes.

Mr. SHERLEY. There was one 14-inch gun on a railroad car; and that was to be true as to it?

Gen. CROZIER. Yes.

Mr. SHERLEY. And one 16-inch howitzer on a railroad car. The estimate originally contemplated six, but the change in the moneys appropriated contemplated the building of one?

Gen. CROZIER. Yes.

Mr. SHERLEY. Six 16-inch guns on disappearing carriages. Now, as to them, was it contemplated to complete them?

Gen. **Crozier.** Yes; they were fully provided for.

Mr. **Sherley.** And some work on the turrets for the two 16-inch guns that were to go at the eastern entrance to Long Island Sound?

Gen. **Crozier.** Yes, sir.

Mr. **Sherley.** Now, the statement that appears as to the Rockaway project is to the effect that the project contemplates putting four 16-inch guns there?

Gen. **Crozier.** Yes, sir.

Mr. **Sherley.** And the estimate contemplates funds for the building of two of those guns?

Gen. **Crozier.** Yes, sir.

Mr. **Sherley.** So that, as I said a while ago, with this $996,000 all of those guns and carriages and some work on the turrets should be supplied?

Gen. **Crozier.** Yes, sir.

Mr. **Sherley.** Now, you are asking this year for $8,235,000, with a contract authorization of $2,200,000, which would amount in substance to giving you enough to take care of your contract authorizations and $5,235,000, and the right to further obligate the Government for $2,200,000.

Gen. **Crozier.** That is correct, leaving out the supplemental estimate for $996,000 which you mentioned a moment ago.

Mr. **Sherley.** Now, what do you expect to with all this money?

Gen. **Crozier.** We expect to apply $800,000 of it to eighty 3-inch antiaircraft guns and mounts; to apply $1,120,000 to sixteen 16-inch mortars and carriages; $122,000 to four 6-inch guns and carriages; $110,000 to two more long-range barbette carriages for 12-inch guns; $35,000 for certain accessories for the 14-inch gun mounted on the railroad car, which was included in last year's program, which accessories relate to the service of that piece on a railroad carriage. It may be said to be a part of a railroad train. You see, that 14-inch gun and its carriage on the car is not a unit by itself, but it would be a part of a train, which must include a wrecking car for handling the ammunition, etc., and this $35,000 is for some of the other parts of that train. The 14-inch gun on that railroad car, as appropriated for last year, will be capable of test at the proving grounds, but to make it capable of service away from the facilities at the proving ground the trian will have to be completed, and that will cost $35,000.

We will apply $1,300,000 to four 16-inch guns on disappearing carriages, and $733,000 toward the completion of the turret to go at the eastern end of Long Island Sound, which, with the $400,000 in the supplemental estimate, will complete that turret project so far as the Ordnance Department's part of it is concerned, with the exception of the $150,000 which has been included to apply to the Fort Sumter carriages, which will remain still to be appropriated for: we apply $440,000 to four 16-inch howitzers on railroad mounts. Those items are all included in the board of review's project calling for $96,000,000 for the United States, the insular possessions, and the Panama Canal, and they amount to $4,660,000. Now, having used the prices of the board of review's project they should be increased by 25 per cent, taking into account the increased cost, and that will bring the sum up to $5,825,000. Then, to that should be added the contract authorization which we were given last year of

$3,000,000, which makes the total of $8,825,000. Now, in addition to that, there are included in my estimates certain items which do not come under the Board of Review's $96,000,000 project, and they are as follows: Two 12-inch disappearing carriages for Fort Sumter, $150,000; four 14-inch guns on railroad mounts, in addition to the experimental ones we have been talking about heretofore, $780,000, and six 12-inch howitzers on railroad mounts, $360,000. Those three items are not in the $96,000,000 project of the Board of Review, and, altogether, they amount to $1,290,000. Adding to that sum the 25 per cent for higher prices brings the total for those three items to $1,610,000. So that we have for the items included in the $96,000,000 program of the Board of Review $8,825,000, and for those three items not included in that program $1,610,000, making that amount $10,435,000, and if to that sum there is added $996,000 for the supplemental estimates of which you spoke awhile ago the sum total is brought up to the $11,431,000 which is contained in my original estimate and the supplemental estimate, including the contract authorization of $2,200,000 which I am asking for.

Mr. **Sherley**. Now, General, this is the biggest appropriation for a good many years in the way of providing seacoast armament.

Gen. **Crozier**. So it is, Mr. Chairman. I will invite your attention to the principal items and to the new character of those items, taking the first one I mentioned—$800,000 for antiaircraft guns. That is a new kind of defense that is required and has to be provided for new conditions in recent years. Consider the item of $110,000 for two barbette carriages so designed as to give the guns a higher elevation and longer range; those are put in for the purpose of meeting the newly developed long ranges used by the naval vessels. Then, consider the item of $440,000 for 16-inch howitzers on railroad mounts. That is an entirely new kind of demand for very heavy movable artillery for seacoast purposes. The other principal items, namely, the $1,120,000 for sixteen 16-inch mortars and carriages and $1,300,000 for four 16-inch guns and carriages, and $733,000 to be applied to the turrets at the eastern end of Long Island Sound, are really additions to the defenses which were thought, before the Board of Review took up this project, to be sufficient. They do not depend very much on anything new that has been brought out, but are provided simply from an increased appreciation of the strength of the attack that can be made, without reference especially to new gun features.

Mr. **Sherley**. It also contemplates covering areas not now covered in connection with the New York defenses and which may be necessary because of the increased range of guns of current battleships?

Gen. **Crozier**. Yes, sir; to some extent.

Mr. **Sherley**. There are practically two new modifications or amplifications of the Board of Review's project, as submitted last year, which totaled about $96,000,000, one of them being the mounting of two 12-inch guns now at Fort Sumter, Charleston, on new carriages, permitting an all-around fire, and then what might be called an increase in the proposals touching heavy movable seacoast armament in the way of 14-inch guns and 12-inch howitzers?

Gen. **Crozier**. Yes, sir; and that last class, the movable artillery, is required, as I said in regard to some of the items just mentioned, because of the new kind of defense which is thought necessary, and it is not simply an addition to the defense planned before.

Mr. SHERLEY. I do not suppose that those 14-inch guns and 16-inch howitzers on railroad cars in any sense represent a complete program for that kind of seacoast armament.

Gen. CROZIER. They do not. There has been no program made, and those numbers are used as being certainly within any program that is likely to be made.

Mr. SHERLEY. And the determination of the quantity necessarily will be a matter of evolution from time to time?

Gen. CROZIER. Yes, sir; we think so, or, at least, it will be a matter of estimating in the light of better knowledge than we have now—in the first place, in the light of such knowledge as we can have from trying the first ones we make——

ANTIAIRCRAFT GUNS.

(See p. 101.)

Mr. SHERLEY (interposing). Let us take up somewhat in detail these various classes of seacoast guns. The first is the antiaircraft guns. Last year you got appropriations for 54 antiaircraft guns.

Gen. CROZIER. Yes, sir.

Mr. SHERLEY. It was estimated that those guns, with their carriages, would cost about $10,000 each.

Gen. CROZIER. Yes, sir.

Mr. SHERLEY. Have you built any of those guns?

Gen. CROZIER. None are finished yet, but the first gun and its carriage are expected to be done about the first of next month.

Mr. SHERLEY. What will it cost?

Gen. CROZIER. The carriage costs $6,800 and the cost of the gun was about $3,900, making the cost of the gun and carriage $10,700.

Mr. SHERLEY. Running about $700 over the amount estimated. In the estimate you are now submitting for 80 additional guns have you added 25 per cent to the original estimated cost of $10,000 per gun and carriage? If that is true, the cost will be greater than the cost of this particular gun and carriage.

Gen. CROZIER. Yes, sir.

Mr. SHERLEY. So you anticipate still more increase?

Gen. CROZIER. We are prepared for it. It is impossible to tell, but I hope that the cost will come down. However, I do not want to hazard such a prediction as that.

Mr. SHERLEY. General, some testimony was had in connection with the estimates for the emplacement of antiaircraft guns made last year to the effect that this money had not been expended due to the fact that when inquiry was made of the local officers as to the exact location at each fortification for these emplacements, replies were had suggesting, in many instances, the desirability of not emplacing them at all, but having them movable; and also it was found that in some places, due to the restricted area of the reservation, suitable ground was not now owned by the Government for the emplacements even if they should be fixed, and that the cost of procuring ground in some instances would be very great. It was therefore suggested that it might be deemed wise in some instances to have the guns made mobile and not placed on fixed emplacements, and in other instances to have the guns and carriages stored at the fortifications with the idea of putting them upon emplacements outside of the reservation in the event of actual hostilities. Now, in view of that, what have you to say touching your estimate for 80 additional guns and carriages and the appropriation heretofore made for 54? May it not be possible that you will not want to build that many carriages, or, at least, the same type of carriage, that you contemplated in the beginning?

Gen. **Crozier.** We are engaged on the design now of a truck which will carry the 3-inch antiaircraft gun and mount, as they are designed for use in connection with the seacoast fortifications. Those trucks can be used for the purpose which is contemplated in your question. They are not designed to move rapidly, but the use which you mentioned of those seacoast antiaircraft guns does not require rapid movement, but it simply requires very ordinary mobility. There is another kind of truck for antiaircraft guns which should be capable of rapid movement, but the one which we have under design would not be suitable for those powerful seacoast guns, and it is, therefore, being designed for field guns for field use, and has nothing to do particularly with seacoast fortifications. The other one—the heavier one—which will take this gun and carriage, will also be suitable for certain kinds of field work; that is to say, it can be moved to any place where the Army may be engaged in operations which do not involve rapid movement of the Army itself. I mention that in order to indicate where the funds might come from. Those trucks, when used to take care of guns and mounts and for seacoast-defense purposes, if they are exclusively assigned to this purpose, I suppose, could be paid for from funds appropriated in the fortifications bill; but there is always a sort of indefinite line with regard to some of the matériel which is used in connection with seacoast defenses. For instance, we have certain field artillery assigned to the land defense of seacoast fortifications, and that is procured from the field-artillery appropriation, notwithstanding the fact that it is assigned to that use.

Mr. **Sherley.** The point I am getting at is this, whether the carriages that you now contemplate building are the same character of carriage you would build, whether the gun is to be emplaced or is to be used as a movable gun. It may be that you have already indicated that——

Gen. **Crozier** (interposing). That I intended to indicate as being the same kind of carriage.

Mr. **Sherley.** I gathered that from your statement. Now, that being so, would you still want to go ahead at the rate that these estimates would contemplate going ahead with the building of those guns and carriages, leaving to subsequent events the determination of this problem of whether they are to be emplaced or made mobile?

Gen. **Crozier.** I would want at least as much money as I have estimated for; and the question that is raised is whether there should not be more money included in the estimates so as to provide for those movable trucks.

Mr. **Sherley.** General, even assuming that it should be determined to supply some of those guns and carriages with trucks so as to make them mobile, there is nothing in the language of this appropriation which would restrict you or prevent you from building such trucks, though, of course, to the extent that you had to build trucks you would have a less sum for the building of the guns and carriages?

Gen. CROZIER. I think that is so. I think that trucks could be interpreted for that purpose as being a part of the carriage which would permit the utilization of the funds for constructing some trucks.

Mr. SHERLEY. You will want this money you are now asking for, then, irrespective of how this question may be determined?

Gen. CROZIER. At least these sums; yes, sir.

Mr. SHERLEY. I will ask you, Col. Winslow, whether you and Gen. Black made any statement as to when this question might likely be determined?

Col. WINSLOW. Neither Gen. Black nor myself made a statement as to when a final determination might be expected as to the locations for any antiaircraft guns. Gen. Black did testify that the department commanders had been sent letters asking them to report on certain features connected with these locations, but we can not estimate now when those answers will be received in all cases nor when the matter will be definitely settled.

Mr. SHERLEY. General, I believe you testified that you have already finished one gun and that the carriage for that gun will be finished in January. That was of arsenal manufacture?

Gen CROZIER. Yes, sir.

Mr. SHERLEY. Have you any contracts out for any of those guns and carriages?

Gen. CROZIER. I have for some of the carriages. There are contracts out for 21 of the carriages.

Mr. SHERLEY. What price?

Gen. CROZIER. At $6,700 apiece, and there are orders for 51 carriages at the Watertown Arsenal at an estimated cost of $6,500 each.

Mr. SHERLEY. There is a difference of $200 between the arsenal cost and the private manufacture cost?

Gen. CROZIER. Yes, sir. Col. Rice reminds me that the estimates include certain accessories that were not in the contract price, which amount to about $200.

Mr. SHERLEY. How fast do you expect deliveries either from the arsenal or private manufacturers?

Gen. CROZIER. We expect the whole 21 to be delivered by the private manufacturers in 14 months from last September, and the 51 at the arsenal in 15 months from last July.

Mr. SHERLEY. Did you have any competition in the bids for this work?

Gen. CROZIER. Yes, sir; we had bids from three bidders, and the one I have just given you was the lowest bid. The other two in order were $9,455 apiece and $10,801 apiece.

Mr. SHERLEY. Who got the contract?

Gen CROZIER. The Bethlehem Steel Co.

Mr. SHERLEY. How do you expect to obtain those 80 other carriages?

CAPACITY OF ARSENALS.

Gen. **Crozier.** We have not divided up the material in the project for which I am estimating now as between arsenal procurement and private factory procurement. With reference to the capacity of the arsenal, I can say that the capacity of the Watervliet Arsenal for the manufacture of the guns is, as I stated yesterday, sufficient to carry out the program.

Mr. **Sherley.** I was assuming that you were going to build the guns in the arsenal.

Gen. **Crozier.** Yes, sir. Now, with reference to the carriages: The total capacity of the Watertown Arsenal for work on a two-shift basis is about $1,250,000 a year, so that to the extent that the procurement of carriages will require funds in excess of that amount the orders will probably have to be placed outside. Just how the orders will be divided and just what items will be placed at the arsenal and what outside will depend upon the occupation of the plant at the time. I can give a general statement, however, as follows:

The annual capacity of arsenals on a two-shift basis for field-artillery work is as follows:

Rock Island Arsenal	$2, 720, 000
Frankfort Arsenal	375, 000
Watervliet Arsenal	765, 000
Total	3, 860, 000

If the estimates for the years 1917 and 1918 for field artillery are appropriated and authorized, all of the field pieces to be procured under the appropriations can be manufactured at the Watervliet Arsenal, the forgings, necessarily, to be procured by purchase; but no work can be done at either Frankford Arsenal or Rock Island Arsenal, as the orders which those places now have and which will be given them from the appropriations made at the last session of the Congress will occupy their total capacity for more than two years.

The Rock Island Arsenal manufactures field gun and howitzer carriages, ammunition vehicles, battery and store wagons, and similar classes of matériel; the Frankford Arsenal manufactures sights, fire-control instruments, fuze setters, etc., and the Watervliet Arsenal manufactures fieldpieces proper, with their tools, accessories, and spare parts.

The annual capacity of arsenals for the manufacture of seacoast matériel, on a two-shift basis, is as follows:

Frankford Arsenal	$175, 000
Watertown Arsenal	1, 225, 000
Watervliet Arsenal	1, 450, 000
Total	2, 850, 000

If the $13,915,000 included in the estimates for 1917 and 1918 for the manufacture of seacoast artillery matériel are authorized and appropriated, a little short of $3,000,000 worth of the work can be done at arsenals in a year, leaving approximately $11,000,000 to be expended under contract.

The Frankford Arsenal manufactures sights, fire-control instruments, and similar matériel; the Watertown Arsenal manufactures gun carriages, with their tools, accessories, etc., and the Watervliet Arsenal manufactures the cannon, with their tools, accessories, etc.

Mr. **Sherley.** Speaking of the capacity of the arsenal, you mean its capacity for this class of work?

Gen. **Crozier.** Yes, sir.

Mr. **Sherley.** How soon do you expect, then, or do you know how soon you will procure the 134 gun carriages?

Gen. **Crozier.** I have just stated when I expect to get the first 54 of the 134, and that when we may get the remainder will depend upon the way in which we can place those orders in connection with all the other orders we will have to place when we get at the task of placing them after the appropriation is made.

Mr. **Sherley.** The reason I asked that was not only to know how soon these added defenses will be available for the country, but also to determine whether you needed all of this money now.

Gen. **Crozier.** The only doubt as to our needing it would arise from the doubt as to the ability of the manufacturers of the country to do this work. Now, so far as the gun carriages are concerned, although we got only three bids the last time we advertised for bids for this work, there are plenty of manufacturers in the country capable of doing the work, and it seems to me that the only prospect of an early realizing of the defenses that these guns will provide is to secure the money and let us go as far as we can in an effort to get some of the people who can do it to build the carriages.

Mr. **Eagan.** Are American manufacturers making carriages of this type for European Governments, and the guns, also?

Gen. **Crozier.** No, sir; not very many. There is only one establishment I know of making guns, but there are two, and, perhaps, three establishments making forgings for guns, but not finishing the guns. There are two establishments making carriages, one of which is making only a small number of carriages of rather large size, while the other is making a much larger number of carriages of different sizes, both large and small.

Mr. **Eagan.** Is it not likely that if the prices prevailing now should prevail during the period of the construction of those 80 additional antiaircraft guns, with the experience you will have in making the 54 antiaircraft guns, you will be able to make those 80 at a lower price at the Government arsenals?

Gen. **Crozier.** I think that is likely. As I said a moment ago, all the orders that the arsenal has now for making carriages will be executed by next November, in accordance with the program. It could commence on some new orders, of course, before the entire execution of these old orders, because they could commence on the earlier stages of the work on some carriages while the final stages of the same work on the other carriages are being carried on; but I think it is a fact that a considerable proportion of this would have to be given out to private contract—that is, the contracts for these new ones. A general answer to the whole idea that is embodied in your question, Mr. Chairman, would be this: It seems to me that in our present state of defense, particularly with reference to antiaircraft artillery, it is incumbent on us to secure the means for doing it, and then to get at the process of drawing on the resources of the country for purchasing this armament just as quickly as we can do it, and it is scarcely defensible to put off appropriating funds for this purpose because we do not now see directly before us a definite program by which the funds can be promptly applied.

Mr. **Sherley.** Are you going to be able to turn out the gun piece itself as fast as you need to?

Gen. **Crozier.** The difficulty is in the delivery of the forgings, and there again we have some of the same kind of trouble I have been mentioning with reference to the completion of the carriages themselves. For instance, for those guns that we are talking about now, of which there are some 18 provided for places outside of the United States in addition to the 54 we have been talking about for the United States, all of the forgings will be delivered under the existing contract next November. Final delivery will take place next November, which will put off the final completion of these guns, irrespective of the carriages, until January, 1919—that is, two years from this coming January. Now, there is always a possibility, particularly with an order of considerable size, of getting manufacturers to make an extra effort, and I am not without hope that there may be additional manufacturers of gun forgings brought into the market, particularly for guns as small as these antiaircraft guns.

FORGINGS, MAKING OF.

Mr. **Sherley**. Some years ago we were led to somewhat indulge the hope that you would be making forgings big enough for these guns yourself.

Gen. **Crozier**. Yes, sir; but we have not done it. We have not had any better success in producing those forgings than was indicated when I was before you last year. I will say, however, that we have occupied our plant at Watertown Arsenal with the production of forgings other than gun forgings, but inasmuch as we had not a steel-making plant—that is, a plant for making steel billets—in such a stage that we could make our own steel from the beginning, we had to rely upon the purchase of the billets and the subsequent forging of them in our own shops, which did not prove successful. We have not, since I was last before you, been pursuing that effort to make gun forgings, but we may take it up again in connection with the operation of a new furnace for making steel which we have recently got going at the Watertown Arsenal in connection with other work, particularly in the manufacture of armor-piercing projectiles. It may be possible that we can make our own steel from the pig iron with that furnace. We may be able to do better with the making of forgings for guns, but it is a very difficult process.

Mr. **Sherley**. General, what do you have to pay for the steel forgings that you use in making these antiaircraft guns?

Gen. **Crozier**. The order for the forgings for the 71 guns appropriated for last year was placed at 54½ cents a pound.

Mr. **Sherley**. Do you get any competition in the furnishing of these steel forgings?

Gen. **Crozier**. We generally get bids from two companies, and we have had them at times from three companies. We have had some competition from the third company, and they have sometimes succeeded in furnishing forgings and sometimes they have not.

Mr. **Sherley**. Is there any variation in the price?

Gen. **Crozier**. Yes, sir; there is usually some variation in the price, but our experience has been that the third company, which has not been in business very long, but which has made one or two offers—our experience has been that their prices are pretty near those of the older companies after some experience in trying to furnish forgings.

Mr. **Sherley.** Is there any real competition between the two older companies? Those two companies are the Bethlehem and Midvale, are they not?

Gen. **Crozier.** Yes, sir. I think there can be said to be competition between them, although their bids art usually not very far apart. For instance, we advertised a short time ago for the manufacture of some 16-inch guns, and we got bids from those two companies which for the same circumstances were $220,000 and $205,000 per gun. There was no great difference, but still there was quite enough to decide between the two companies.

Mr. **Sherley.** Does the Navy make any of these forgings?

Gen. **Crozier.** Let me answer your last question a little further. We also advertised for the forgings for some 16-inch guns, and, although the bids from those two companies were not the same, they were near enough alike to indicate that we should divide the order between the two for the purpose of securing rapid delivery.

Mr. **Sherley.** Were they near enough alike to indicate that there had been some concerted action?

Gen. **Crozier.** No, sir; I do not think that could be deduced from their bids.

Mr. **Sherley.** Does the Navy make any of these forgings?

Gen. **Crozier.** No, sir; they do not make forging for guns.

Mr. **Sherley.** Do you believe that you could get the forgings for these antiaircraft guns fast enough to keep your arsenal busy?

Gen. **Crozier.** That is pretty hard to say just now. This whole subject of the procurement of work to be done for the Government perhaps raises the question as to the necessity for legislation which will permit the precedence of Government contracts over orders given by parties other than the United States Government. You see, now the manufacturers have orders from foreign Governments, for instance, and they are under the obligations of their contracts. Now, those contracts involve a stipulated time for delivery; and even if the manufacturer should want to do so, he could not jeopardize those times of delivery through any preference given the United States Government's orders without incurring damages or the risk of damages or reduction of prices at the hands of the parties from whom he has orders already. Now, legislation might be enacted which I think might relieve him from liability for such damages as that under his contract with other people.

CONSTRUCTION OF 16-INCH MORTARS.

Mr. **Sherley.** General, the next item is for $1,120,000 for sixteen 16-inch mortars and carriages. No part of last year's appropriation was for the purpose of building 16-inch mortars?

Gen. **Crozier.** No, sir; they were not included in the program.

Mr. **Sherley.** How do you expect to procure these? You would make, of course, the piece in the Government arsenal, buying of necessity the steel forgings?

Gen. **Crozier.** Yes, sir.

Mr. **Sherley.** How about the carriages?

Gen. **Crozier.** That depends upon the state of the work at the time we give the orders. As I said a moment ago, you can give $1,250,000 of work to the Watertown Arsenal to be completed in the course of a year. Now, that $1,250,000 capacity at the Watertown Arsenal is for gun-carriage work.

Mr. **Sherley**. I asked you about that a moment ago. I asked you whether that capacity you had indicated was in connection with the carriages for the antiaircraft guns only, and in response to my inquiry you replied in the affirmative. That was due to a misunderstanding of my question?

Gen. **Crozier**. Yes, sir; I did not understand the question. The $1,250,000 capacity of the Watertown Arsenal relates to gun-carriage work in general and not to antiaircraft gun-carriage work alone.

Mr. **Sherley**. So that you really are not in a position to say what amount of it you can do at the arsenal. You will do some of it, will you not?

Gen. **Crozier**. Yes, sir. I can only state it with reference to the total value of the work which I can turn out at the arsenal.

Mr. **Sherley**. But you will actually build one 16-inch carriage?

Gen. **Crozier**. In all probability; yes sir. Out of the 16, in all probability there will be several built at the arsenal. I like to build some of each different model at the arsenal for several reasons. One is that I can then get a better line on the proper prices than if there were none at all built at the arsenal, and another reason is that after having built those carriages at the arsenal we will have patterns and perhaps we would have templets and other appliances which would permit us to effect repairs more easily than if we did not have them on hand.

Mr. **Sherley**. You have the design for those gun carriages?

Gen. **Crozier**. A design is under way for the 16-inch mortar carriages and it is expected that this design will be finished about next April.

Mr. **Sherley**. You will furnish the contractor, then, with the design and specifications?

Gen. **Crozier**. Yes, sir: in this instance we expect to furnish the contractor the full design and specifications, so that we will not depend on his designing force at all.

Mr. **Sherley**. A while ago you spoke of there being a number of manufacturers that ought to be in a position to build carriages. You were then talking about carriages for the antiaircraft guns?

Gen. **Crozier**. Yes, sir.

Mr. **Sherley**. Does that apply also to the carriages for these mortars?

Gen. **Crozier**. Yes, sir; but the number who can build as heavy carriages as those required for these mortars is much more limited, of course, but there are still several in the country who can do so.

Mr. **Sherley**. Who are not now bidders for such work?

Gen. **Crozier**. Yes, sir; who are not now bidders for such work.

Mr. **Sherley**. Is there any reason to believe that you can induce them to enter that field?

Gen. **Crozier**. All I can say is that I can try. There are some limitations which they do not like. They particularly do not like the eight-hour limitation, or many of them do not. There is, of course, a 25 per cent limitation, but I do not think that would deter them from bidding. In fact, I do not think they would like to admit in the beginning that they do not care to bid because they would think that they had to ask more than 25 per cent more than the Government cost in order to turn out the work at a profit. So that I should say that the only statutory limitation that would make trouble in securing bids would be the eight-hour limitation.

Mr. Sherley. You have an appropriation which we will come to subsequently, and we will go more into detail in regard to it, relative to the equipment of private manufactories with dies, etc., for making material desired by the Government. Is that applicable to this character of manufacture?

Gen. Crozier. It will be legally applicable.

Mr. Sherley. I mean physically applicable.

Gen. Crozier. No, sir; I think not.

Mr. Sherley. I rather thought it was not. These mortars are to go where?

Gen. Crozier. Eight of them are to go at Cape Henry and eight at Rockaway.

Mr. Sherley. When do you expect to get them?

Gen. Crozier. I have not estimated on that.

Mr. Sherley. I do not mean to tie you to days or months, but I mean broadly speaking.

Gen. Crozier. The designs ought to be finished by next April; and if we could give out an order for, say, six to each of two private manufacturers and, say, four at the Watertown arsenal, I should think that they ought to be manufactured within, say, 14 or 15 months from next April; that is, from the time the orders are placed.

CAPE HENRY.

(See pp. 9, 19, 66, 187.)

Mr. Sherley. When did we authorize the purchase of the site at Cape Henry, do you recall?

Col. Winslow. The last act appropriating money for the site was passed in May, 1914, and the purchase was consummated in June of that year.

Mr. Sherley. In May, 1914, Congress entered upon the Cape Henry project. This is December of 1916, and you will not get your mortars for two years.

Gen. Crozier. A year and a half or two years; yes.

Mr. Sherley. After they are obtained it will be some six months or more before they are emplaced?

Gen. Crozier. Yes; and that you can put at two years, I should say.

Mr. Sherley. So that at the utmost it will be at least five years or better before you will have any fortifications there?

Gen. Crozier. It will be the winter of 1918 and 1919 before these mortars get there, and I am not certain but that the situation is not still worse with reference to the 16-inch guns.

Mr. Sherley. The guns will be even longer delayed?

Gen. Crozier. Yes. Col. Hoffer reminds me that the best estimate we can make now, taking into consideration the time for the delivery of the forgings and the time for the manufacture of these mortars, is that it will be about two years and a half after giving the order, which can be done as soon as this money is made available, although the drawings are not yet completed.

Mr. Sherley. What about the guns?

Gen. **Crozier.** Of the 16-inch guns we have six which are under way now, and the best estimate we can make is that the sixth one will be completed early in 1920, and I am not certain that we will meet that estimate.

Mr. **Sherley.** That means more than six years from the time of entering upon the project by enactment of Congress before you can hope to put all of the armanent there?

Gen. **Crozier.** Yes.

Mr. **Sherley.** It is also true, is it not, that up to this time every dollar that you have asked for touching this fortification has been given you?

Gen. **Crozier.** Yes; it is true that all the money we have asked for has been given us.

Mr. **Eagan.** You mean at Cape Henry?

Mr. **Sherley.** Yes; I am talking about this fortification.

Gen. **Crozier.** I am not so certain, however, that you gave us the money as quickly as we would have wanted it. For instance, you say that the purchase of the site was authorized in 1914?

Mr. **Sherley.** In May, 1914.

Gen. **Crozier.** Now, we got the money for these 16-inch guns in the last appropriation act.

Mr. **Sherley.** But that is as soon as you asked for it. There has never been a refusal by Congress if any moneys that you have asked for in connection with the fortification at Cape Henry after it was once determined to be built; is not that right?

Maj. **Embick.** That is true except as to the 1908 estimates.

Mr. **Sherley.** But you did not understand my statement. I said that after Congress had determined upon the building of it?

Maj. **Embick.** You are right, sir.

Mr. **Sherley.** And it is exceedingly fortunate that we did not take the 1908 estimates, in view of the complete abandonment of anything that resembles the program that was then suggested for the fortification of the mouth of the Chesapeake.

Gen. **Crozier.** By the proceedings of the special board on the Cape Henry fortification the project was changed so as to substitute 14-inch guns for the 12-inch guns which had theretofore been included in the project, in March, of 1914.

Mr. **Sherley.** I am not taking into account anything prior to the appropriation by Congress for the purchase of the site.

Col. **Winslow.** The condemnation court presented its report about the latter part of March, 1914, and the cost of the site exceeded by about $31,000 the funds then available. The matter was presented to Congress, and Congress within a very few weeks appropriated the money, and the money was actually paid into court in June of 1914, within about five days before the expiration of the 90 days authorized by law after which the condemnation would have become void. About that time the Cape Henry fortification board, of which I was a member, presented to the Secretary of War plans and estimates of the cost of beginning the work, and the Secretary directed that those plans and estimates be not presented to Congress. That was in the fall of 1914, and it was not until the fall of 1915 that the estimates were permitted by the Secretary of War to come before Congress. So that Congress really did not enter upon the project for the fortification work until the passage of the last fortification bill on July 6.

Mr. **Sherley**. But is it not also true and fair to say, touching the action of the Secretary of War, that there was a discussion as to the character of the primary armament, and that at about that period of time a shift was made in the primary armament from 14-inch guns to 16-inch guns, and that even had the estimates been then submitted and the money appropriated, due to that change, the money could not have been used?

Col. **Winslow**. The estimates and plans submitted to the Secretary of War were both for 14-inch emplacements and for 16-inch emplacements.

Mr. **Sherley**. But the War Department had not come to a final conclusion as to whether it wanted 14 or 16 inch guns?

Gen. **Crozier**. Let me say a word about that. The department had come to a final conclusion which did not remain final, and which is something that could be said about the conclusion we have reached now. If you were to provide the money for these fortifications for two years to come, it is not at all certain that we would not change to 18-inch guns. The 14-inch gun was definitely decided upon, but inasmuch as the manufacture did not get started for something over a year, it was concluded that the project would be changed to include 16-inch guns.

Mr. **Sherley**. But it did not get manufactured, because the department did not submit the estimates: and while I do not know why the department did not submit the estimates, I assume, from various understandings that I have had, it was because there was such serious agitation in favor of 16-inch guns that the department felt warranted in waiting a year. But the point I am getting at now is not why you postponed your estimates, but the fact that we have met your estimates in each instance touching the Cape Henry fortification, and that while the project was entered upon by Congress by appropriation in May of 1914, it will be after 1920 before the fortification is completed and turned over to the Artillery?

Gen. **Crozier**. Yes, sir: that is probably true. Now, that all carries the implication that the construction work in this kind of matter is very slow. It is slow.

Mr. **Sherley**. General, before you proceed I want to say this: Inasmuch as I have introduced the subject that it carries that implication without necessarily carrying a censure, because there is a dis[illegible] there. I am not implying who is to blame or that anybody is to blame. There may be many contributing causes, some of them inherent in the work itself; some of them may be of congressional [illegible], and some of them may or may not be due to the administration of administrative officers. However, I think it is worth while [illegible] brought out.

[illegible] I [illegible] it is worth while [illegible] would seem to [illegible] length of time that [illegible] accompanied, if practi[illegible] and I will make [illegible]

[illegible] which I am [illegible] battleship carrying armament correspondingly heavy within a very much less period of time than that?

Gen. **Crozier.** Measured from what starting point, Mr. Chairman?

Mr. **Sherley.** Measured from authorization to commission.

Gen. **Crozier.** No; that is measured from the date of the appropriation of the funds necessary——

Mr. **Sherley** (interposing). To the commissioning of the ship?

Gen. **Crozier.** Yes. Now, measuring from the date of the authorization of the funds necessary to provide the armament, at least, for this Cape Henry project, the time would run from July, 1916, to February, 1920.

Mr. **Sherley.** I could limit it there, but I want to go back of that because Congress is not responsible for the delay, if there be delay, in the designs and plans which are the predicate for the estimates for the funds. It seems to me the fair comparison is from the time that Congress undertakes through appropriations to start each project; in the one instance, the building of a battleship, and in the other instance the building of a fortification. Now, with a battleship it would start with the authorization and the appropriation for such parts of it as may be necessary, and the time would be from that date until the ship goes into commission. With the fortification it would be, in this instance, from the procurement of the site until the fortification is turned over to the Coast Artillery.

Gen. **Crozier.** Now, Mr. Chairman, may I say this: If you would follow the same processes as followed in the Navy; and that is, at the time you authorized the site, make the appropriation of funds and the accompanying authorization to contract obligations covering the cost of the armament at least, the completion of the entire project would be considerably accelerated.

Mr. **Sherley.** I agree with you; but we can not do that unless the department sees fit when it asks for the fortification of a given place, and with it the purchase of a site, that it submit estimates for the armament. Now, General, this, I think, is fair to say of this committee: When I became chairman of the committee it was apparent that there were a great many fortifications in a partial state of completion, more or less serious according to individual cases; in some instances in regard to fire control and in others in regard to searchlights, etc. In a measure that situation exists to-day, although to a very, very much less degree.

Gen. **Crozier.** Yes.

Mr. **Sherley.** It became the policy of this committee, never expressed, perhaps, openly, but shown by its recommendations, whenever it undertook a new program to proceed with it to completion as fast as demand should be made upon it by the department, and I think, speaking by and large, that has been carried out, and that funds have always been made available.

Gen. **Crozier.** Taking this Cape Henry project, Mr. Chairman, I can say to you that the Ordnance Department would have been able to have its part of that project completed before its part will now be completed if it had been permitted to start upon any of the plans that have preceded the ones we are now working on, as soon as the plans were made and advanced far enough for it to go ahead.

Mr. **Sherley.** If I understand you, it has been the change of the plan that has caused delay?

Gen. **Crozier.** Yes; there has been what might be called a dilatory method followed; that is, as soon as there has been a suggestion of a change of plan, there has been a disposition carried into practice to drop the matter of providing funds until that plan should be completed, and not provide anything until the plan should be completed. Now that is a very dilatory process. Months sometimes come in between the time of completion of the project and the time you can get it before Congress, and then months elapse for its consideration by Congress, and if you follow that process once or twice you can spread the completion out a very long time.

Now, in March, 1914, there was a project involving, it is true, 14-inch guns for this Cape Henry fortification. Now, if we had gotten the appropriation for the armament, based on that project, soon after March, 1914, the project would have been completed two years earlier than it will be completed, because we did not get any authorization to start until July, 1916, more than two years later. We had a project we were ready to start on, and we could have started on it at least by March, 1914.

Mr. **Sherley.** General, that is a matter which rests with the War Department.

Gen. **Crozier.** Well, I suppose the War Department has part of the responsibility.

Mr. **Sherley.** Has it not all the responsibility as to that? Has Congress in any way required a cessation or the loss of months or the dropping of matters because of a change in plan or of idea touching the character of the fortification? Is there any law relative to this particular point which you are making which is applicable except the one provision which says that as to emplacements estimates shall not be submitted unless they be based upon plans and specifications?

Gen. **Crozier.** I do not remember any law except that one that would require us to have a particularly advanced stage of designs and drawings before submitting an estimate.

Col. **Winslow.** Mr. Chairman, in your remarks you have suggested that one of the reasons why estimates for beginning work at Cape Henry were not submitted in the fall of 1914 was that the plans had not been completed. That, I think I can say, is not so. The plans had been completed and the estimates were submitted prior to the middle of September, 1914, and a few days later I was present at a conference in the office of the Secretary of War, when he called in all of his bureau chiefs and went carefully over all of the estimates that had been submitted. He stated it was considered that the total exceeded the amount which the then condition of the Treasury could stand, and he proceeded to go over the estimates item by item, asking in each case the proper bureau chief as to whether a reduction was not possible in each item.

The items relating to Cape Henry were cut out at that time by his order, because he considered that those items were not as important as some others which had to go in. Am I not correct, Gen. Crozier? You were present at the time.

Gen. **Crozier.** Yes; but I think I would make the statement a little differently, by saying that the Secretary called upon the proper bureau chiefs for the designation of places where the reductions could be made with the least harm and not where a reduction could be made without any harm.

Col. **Winslow**. That is my understanding. It was decided in that informal discussion that the Cape Henry estimates should go out, and they were therefore not presented to Congress, not because the department had not decided upon its policy and was not ready to submit its estimates, but on account of the condition of the Treasury.

Mr. **Sherley**. That was in September, 1914?

Col. **Winslow**. September or October, 1914. The purchase of the site had been completed in June.

Mr. **Sherley**. And they were submitted in 1915?

Col. **Winslow**. They were again submitted in 1915 and appropriations were made in the last act, July 6, 1916, to begin the work.

Mr. **Sherley**. Excluding that year, you would still have more than five years for the time necessary to finish this fortification?

Gen. **Crozier**. Yes. I think, in general, Mr. Chairman, you would have to count on that length of time for such a project. I remember in regard to the project for the fortification of the Panama Canal——

PANAMA CANAL.

Mr. **Sherley** (interposing). I was going to come to that.

Gen. **Crozier** (continuing). That when the report of the first board which considered the subject of those fortifications was made, submitting a project of fortification, it was stated it would take five years from the time of authorization by Congress until those fortifications could be completed.

Mr. **Sherley**. But it took very much longer than that.

Gen. **Crozier**. I do not think it took very much longer, Mr. Chairman, to carry out the project in so far as it was authorized in the beginning.

Mr. **Sherley**. It did in certain instances; for instance, in connection with the 16-inch gun there. It is not there yet.

Gen. **Crozier**. It was not made a part of the project until some time afterwards. Upon subsequent consideration of the subject of those defenses they were added to once or twice, and the 16-inch gun was one of the things that was added. It was not included in the original plan.

Mr. **Sherley**. The mounting of some of the 14-inch guns took over five years, did it not?

Gen. **Crozier**. It took over five years from the submission of the original plan, because the original plan was not acted upon for some time after its submission; but I do not think it took over five years from the original authorization, or if so, a very little over five years.

Mr. **Sherley**. Whatever the times may be none of us desires them to be greater than is necessary. Now, you started to make some suggestions as to how the time could be shortened.

Gen. **Crozier**. The best thing to do to shorten this process is, as I say, as soon as the determination is made to fortify a given locality all funds which are necessary for starting the work should be made available at once, and authorization given to contract all the obligations that are necessary to carry through the project.

Mr. **Sherley**. Now, is not the necessary key to the whole matter the ordnance?

Gen. CROZIER. I think that is probably the longest part of the process, to build our ordnance, and I will say, Mr. Chairman, also, that it is the longest part of the process of building a battleship, and all the rest of the work of building a battleship can be finished probably by the time the ordnance for the ship is finished.

Mr. SHERLEY. How long will it take you—because you have not, except in one instance, made any of them—to get the 16-inch gun and carriages?

Gen. CROZIER. We have placed the order for the forgings for the six 16-inch guns. We did that last September, and the forgings for the first gun are due next August. It is expected that that gun will be completed next autumn. If everything goes as we expect it will be completed by November.

Mr. SHERLEY. You are talking about the piece. How about the carriage?

Gen. CROZIER. The carriage for that gun will not be completed by that time.

Mr. SHERLEY. You are estimating at from the date of the order for the forgings, and not with reference to the whole gun. Speaking now of the piece and the carriage, from the beginning of the whole design——

Gen. CROZIER (interposing). That would take a longer time.

Mr. SHERLEY. From the beginning of the design in the navy, they are constantly changing the design as to the guns, at least. The guns are changed in some degree, at least, because they are constantly changing the calibers.

Gen. CROZIER. Yes, sir. The design for the carriage for this 16-inch gun that I am speaking of was commenced a year ago last September, and it is now in the final stages of completion. Now, with reference to this matter of delay——

Mr. SHERLEY (interposing). First, how long will it take to get the carriage.

Gen. CROZIER. It will take probably a year after the order is given to complete this carriage.

Mr. SHERLEY. So it will take you something over 3 years to get this 16-inch gun and carriage?

Gen. CROZIER. From the time of the commencement of the design of the carriage—yet; that is true. That was September, 1915, and if we have good luck it ought to be finished by the beginning of the spring of 1918, or in two and one-half years.

Mr. SHERLEY. Then, there is the testing and proving. I am speaking now of the time when it is delivered ready to be turned over to the engineers for emplacement.

CAUSES OF DELAY.

DRAFTSMEN IN WASHINGTON.

Gen. CROZIER. Yes, sir; that would be in the neighborhood of three years, undoubtedly, which is just what I would have guessed, if I had made a guess at it at any time within the last six or seven years. Now, one of the places where there has been delay is in its design. I have stated before the Appropriations Committee several times—I do not know whether it was before this subcommittee or not—that I am hampered by restrictive laws with reference to design. I am not allowed to employ draftsmen in Washington at the office where I have to employ them—that is, in my office—for this kind of work, even though I have money available for the purpose, without a special legislative authorization. That is a very restrictive piece of legislation and means a great deal of sand in the wheels of progress in this kind of work. I am also restricted by legislation with reference to securing places for the draftsmen to work, even if I have the draftsmen and the money for it, because space can not be rented in Washington, even where there is an appropriation, without having a special legislative authorization.

Now, it is true that when I have encountered these different things and have worked them out and appealed to Congress for relief at the first opportunity, Congress has attended to the matter, but oftentimes late in the session when it might happen to get to that particular thing. Congress has met my difficulties, it is true, but it has meant a great deal of delay. I have time and time again urged that these hamperings restrictions be swept away. They are imposed for other reasons than for keeping back this kind of work, or from a lack of confidence that the work is not prosecuted as it ought to be prosecuted, or that there will be something done by my office that ought not to be done. I know there are other reasons that dictated those restrictions. I have asked for a special exemption from them, but Congress has refused to grant that, and a large part of the delay for that reason is the fault of Congress. I do not like to say it, but I do blame Congress distinctly for it.

Mr. Chairman, there are some other restrictions under which we labor that make for delay. I have mentioned the eight-hour law and the 25 per cent limitation as to price more than once. There is a kind of delay which they entail which has not yet been spoken of, and I will mention it in connection with the same kind of delay which is entailed by the civil-service laws, for instance. When we have some work before us that we want to do and which involves dealings to which those laws may be applicable, we find that a great deal of inquiry is necessary in order to determine whether we can do this thing or that thing or the other thing under the limitations imposed by those laws. The interpretation of the eight-hour law is so difficult that it has been interpreted differently in some rather important matters by successive attorneys general, and we oftentimes do not know what we can do until after a great deal of discussion, and sometimes after an appeal to either the accounting officers of the Government or one of the legal officers of the Government to inform us as to what we can do. We have right now a very important question as to the placing of large contracts which I have had very great difficulty in deciding myself, and I shall probably have to refer those questions to the accounting officers of the Treasury, with the delay that that course always entails, before I can make those contracts.

Mr. **SHERLEY**. Of course some of those things you have enumerated are inherent in government—that is, in a representative government in which there are checks and balances, and in which there is no autocratic power vested anywhere.

Gen **CROZIER**. Then, of course, we must admit that the delays, in consequence of those methods, are inherent. I should think, with reference to the eight-hour law, that in ordinary times, at least, if not at the present time, it might be possible to secure the operation of that law by permitting us to go abroad, for instance, for our manufacturing work which we can not do at the arsenals, and when we can not get people to take it here under the restrictions of the eight-hour law, and in order that our estimates may not be upset by that process, I think that under those circumstances we ought to be able to get material into the country free of duty.

Mr. **Sherley.** Do you mean by that, that you might compel domestic manufacturers, who will not now bid because they do not want to go on the eight-hour basis to bid, if you were in a position to threaten them with foreign competition for orders?

Gen. **Crozier.** That might be possible, but whether we could induce them to bid or not, we would not have to go without the material. If they would not bid for it and we could not make it in the arsenals, we would still have a source of supply.

Another matter which makes for delay in manufactures, since I am on that point, is the legislation with regard to traveling expenses. All of the traveling expenses of officers of the Army under the present laws have to be paid out of the appropriation for mileage for the whole Army. Now, there is a certain amount of inspection work and a certain amount of securing of information which has to be done through the travel of officers in connection with the manufacture of arms and ammunition. Owing to the fact that the expenses of travel have to be paid out of the mileage appropriation, whenever I send an officer I must write a letter which in theory goes to the Secretary of War, and he issues an order for the travel. If the travel is to be done by an officer stationed at an arsenal through the initiative of the arsenal, that letter has to be preceded by one to me from the arsenal.

Now, it oftentimes happens that, owing to other demands on this mileage fund through military necessities it is short, and therefore the travel can not be done. Consequently the work of the officers with reference to the procurement of material is hampered by delay and held up, and the quality of it somewhat risked while waiting on matters which have nothing to do with the procurement of the material. Now, I think that ought to be corrected by an authorization for the payment of the travel expenses of officers traveling in connection with the design or manufacture of ordnance material from the fund appropriated to procure the material. That is a much better business proposition, because those traveling expenses, which are a part of the cost of the material, would then be charged against the material.

Mr. **Sherley.** Have you ever suggested that before?

Gen. **Crozier.** Yes, sir: I have suggested it before, but not for several years. I have suggested it more than once in the past.

Mr. **Sherley.** Submitting the proposed form of the legislation?

Gen. **Crozier.** Yes, sir.

Mr. **Sherley.** I do not recall it.

Gen. **Crozier.** I do not know whether it was before this committee or not.

Col. **Winslow.** Mr. Chairman. I would like to add, in that same connection, that last spring, in connection with the manufacture of searchlights, not only for fortification purposes, but also for the field Army, the mileage appropriation was so short that we had to wait until after July 1 before there were funds enough to send an officer out to inspect some work that was underway at one of the manufactories. At that time considerable work was being manufactured under charge of the officers on duty at the Engineer depot in this city and this work was somewhat delayed owing to the condition of the mileage fund and the consequent inability to send officers promptly to inspect the work at certain stages of manufacture.

Gen. **Crozier.** I can add that it is the practice of the War Department soon after the appropriation for mileage is made to make an allotment to the different staff departments of the mileage funds which are at their disposal, which allotments they are not expected to exceed without special authorization. I have more than once in very recent years handled my allotment so as to try and provide for contingencies that might occur later on in the year, and have put off certain necessary travel which might be put off until a later period in the year, in order to meet any unexpected demands on the fund. Then, as the year approached its end and I have wanted to utilize those funds, I have had them taken away because of the necessity arising somewhere else with reference to some entirely different things, which sometimes have been brought about by legislation.

In connection with this subject of the limitation on the price at which we can place orders, I will say that in the Army bill appropriations are currently made for artillery, and the limitation there takes a different form—that is, a specified amount is stated which may be used for purchase and the remainder can only be used for arsenal manufacture. Now, that remainder may be of such magnitude that it will occupy the arsenals for a good while, and the work can only be carried on at the arsenals at the expense of stringing it out over a long period. Moreover, since that kind of limitation exists, it is difficult to estimate the delay in my office incident to the careful examination of these appropriations to see whether or not we can place a given order for material at all. We must ascertain whether or not any of these various limitations steps in to prevent our placing the order. That requires us to do a great deal of what might be called scheming and maneuvering in order to get our contracts placed under the limitation, all of which consumes much time.

SHORTAGE IN ORDNANCE OFFICERS AND CLERICAL ASSISTANCE.

Mr. **Sherley.** Have you not omitted to mention what until recently has been the most serious handicap of all that you were under, and that is the shortage both in ordnance officers and clerical assistance?

Gen. **Crozier.** Yes, sir; I have omitted that. I can say that right now I have before Congress an estimate for increasing the clerical force in my office. The clerical force is, of course, an overhead charge, and there is always a fear in regard to overhead charges, and it is probably a perfectly proper fear. But with the experience that we have had and are having I have worked out a presentation of our necessities in the way of increased clerical force. I presented a program last year for increasing the force, and the first step in the program was substantially met by Congress as I presented it; but in the stage in which the legislative bill is at present, the second part of the program, which I am presenting this year, is not met by a shortage represented by the figures 3 and 8. I have asked for 8 more clerks in my office, and the bill as it stands now gives me 3. Now, I am hampered in my office for lack of clerical force. Nobody can put his finger on the exact place where that will cause delay, but so long as there is a lack of clerical force the work of the central organization is bound to be delayed.

Now, with reference to officers. We have fared very badly, particularly within the last year, through a shortage of officers. Congress took some steps last year to remedy this shortage by granting a considerable increase in the number of officers in the department, which will be very helpful, and I am not prepared to say now that the increase allowed by Congress will not be sufficient. I am not going to ask for more than Congress has authorized, but they authorized this increase in five annual installments, and I am very hard pressed right now for officers. It is true that Congress in authorizing the increase placed some language in the appropriation that will permit the President under certain contingencies to effect the increase more rapidly than by five annual installments. I have presented this subject to the Secretary of War, who has had it under consideration, and therefore I am not suggesting now that I need any help along that line that Congress can give.

Mr. SHERLEY. You can not get them even after you are permitted——

Gen. CROZIER (interposing). I shall hope to be able to do it; but with reference to that I will touch on another part of the scheme relating to officers of the Ordnance Department. The number of officers which I asked for to afford the necessary relief to the Ordnance Department was, in that scheme as it was enacted by Congress and, indeed, as it came from the War Department, cut down by some 30 officers; that is, it was cut down by approximately three-eighths, and there was substituted for the 30 officers who were thus cut out an authorization to detail from the line of the Army 30 officers for instruction in the duties of ordnance officers, with the idea that these officers might just as well be prepared for the duties of ordnance officers before they came into the Ordnance Department as after they came into it, the idea being that they would have to receive a certain amount of training in either case. I did not know that there was anything the matter with the idea, and I acquiesced in it when it was suggested to me. But when I came to put it into application the needs of the line of the Army were at once prominently advanced, and instead of getting 30 officers in this way I have been able to get only 8, and that is the number I have under instruction.

Now, the question might be asked: Could I get any more than 8 even if they were authorized to be assigned regularly to the Ordnance Department? And the answer to that is that the 30 authorized to be detailed in this way from the line make holes in the line which can not be filled; they make vacancies that remain vacancies; and that is the objection of those who are confronted with the needs of the line to the process, which has cut this number down to 8, but if these officers could come regularly into the Ordnance Department, that would make vacancies in the line which could then be filled. That is one way in which the scheme has not worked. Now, there is another point still with reference to these officers. I think you have probably noticed that the Ordnance Department lost a good many officers after the commencement of the European war, officers who were bid out of the department by private manufacturers who needed their services. I think, taking it altogether, I suffered in unexpected losses something like a dozen officers. Under the law as it exists those officers who resigned in this way may come back within a limited time, which has not yet expired, provided they are willing to go to the foot of the grade from which they went out.

In the meantime, owing to the increase in the Army, all of their contemporaries have moved up, either into or toward a higher grade, and younger men have moved up into the grades from which they went out. Therefore, if they came back at this time, it would entail the sacrifice of taking a place at the bottom of the long line of younger men, and in some cases very much younger men than themselves, and thus render their prospects for promotion later in their careers practically hopeless.

6-INCH GUNS.

Mr. **Sherley**. General, we went a little afield from the direct items in considering the time that it took to erect new fortifications and the reasons therefor. Coming back to the item, you were asking $122,000 for four 6-inch guns and carriages. They are in addition to the four that were provided for last year?

Gen. **Crozier**. Yes.

Mr. **Sherley**. They are to go where?

Gen. **Crozier**. They are to go at Rockaway Beach as secondary armament. The four for which funds were supposedly provided last year were for Cape Henry.

Mr. **Sherley**. Are you going to build them in the arsenals or outside?

Gen. **Crozier**. I have not decided as to that point. It will depend on the stage of the work at the time the appropriation becomes available, which may not be for nearly three months yet.

Mr. **Sherley**. Of course you have already sufficiently testified to show that a great preponderance of this work has got to be done outside the arsenals?

Gen. **Crozier**. I think so; yes, sir; that seems to be inevitable. I may say that in the past I do not think the Watertown Arsenal has built half of the gun carriages for the seacoast fortifications that are already in existence.

14-INCH GUNS.

Mr. **Sherley**. You then have an item of $35,000 for accessories to the 14-inch gun which is being built and which is to be mounted on a railway car?

Gen. **Crozier**. Yes, sir.

Mr. **Sherley**. What is the physical condition of that gun now?

Gen. **Crozier**. The forgings for the gun have been ordered and they are due, if I remember rightly, next July. The design has not yet been entirely completed, but ought to be completed about March. However, we are saving time by having the order placed for the forgings for the gun.

Mr. **Sherley**. Have you solved your problem as to the mounting of that gun?

Gen. Crozier. We think so; yes. I think we have a design which will answer.

Mr. Sherley. What do you propose doing, locking the whole car or having it so built as to permit the gun to be moved into an emplacement previously prepared?

Gen. Crozier. We do not expect now to move it into an emplacement which has been previously prepared. We expect to make a little preparation of the place where the gun is to be fired, but only such preparation as will be done at the time.

Mr. Sherley. And the gun will permanently rest upon the railway-car platform?

Gen. Crozier. Yes.

Mr. Sherley. You have taken care of your strains?

Gen. Crozier. We think so, yes.

Mr. Sherley. When do you expect to get this car, with its gun mounted, ready for testing?

Gen. Crozier. I do not think it can be done within a year and a half.

Mr. Sherley. You are asking for $35,000 for accessories, plus 25 per cent, which is the case as to all of these items?

Gen. Crozier. Yes, sir.

Mr. Sherley. As I understood you the appropriation that was made for this car contemplated the building of the car, gun, and carriage in such a way as to enable it to be tested by actual firing?

Gen. Crozier. Yes.

Mr. Sherley. But would not so finish it as to enable it to be ready for actual service?

Gen. Crozier. No. We still need about $10,000 for cars to carry some portion of the track which will be needed, and about $25,000 for a car with a crane on it, which will be needed both in the service of the ammunition and some part of the process of getting the gun ready to shoot.

Mr. Sherley. Do you feel sufficiently sure of the success of this gun as to want to spend this money for these accessories?

Gen. Crozier. I would not spend that money until we arrive at such a time that there will be some delay if we do not spend it: I would not spend it until the last minute in order to avoid delay.

Mr. Sherley. You are asking for $780,000 with which to build four more of these guns?

Gen. Crozier. Yes. It is possible that we may do something like this with reference to those four more: I am endeavoring to secure from Europe designs of guns mounted on railroad cars in this way, heavy guns, and we may be able to get one that will be considered useful either for this caliber of gun or for a gun so near it that the designs can be adapted to a gun of this caliber or possibly for a gun of smaller caliber, a 12-inch gun, for instance. If I can get a design that we consider satisfactory and to have had its satisfactoriness demonstrated by actual service in Europe we should want to make an investment in it without waiting for the construction and trial of an experimental gun.

Mr. Sherley. How many spare 12-inch guns have you?

Gen. Crozier. We have seven 12-inch guns for which there is not any definite use fixed at present. They are, therefore, spare guns.

but I think I should say that they are available, among other purposes, for temporarily replacing guns which may be removed from the fortifications for relining after having had the rifling worn by target practice.

Mr. **Sherley.** You have no spare 14-inch guns?

Gen. **Crozier.** No.

Mr. **Sherley.** How many 14-inch guns will you have mounted?

Gen. **Crozier.** Eventually, altogether?

Mr. **Sherley.** Yes. Of course, you are not figuring on any more 14-inch guns for new batteries?

Gen. **Crozier.** Mounted in sea-coast emplacements that means, of ourse?

Mr. **Sherley.** Yes.

Gen. **Crozier.** Twenty-four.

Mr. **Sherley.** And no spare ones?

Gen. **Crozier.** We have an estimate this year, which we will come o later on.

Mr. **Sherley.** This item, then, of $780,000 for four of these 14-inch guns may not be used in just that way?

Gen. **Crozier.** Possibly not, no; but that is what I woul dlike to use it for if it turns out just right.

16-INCH HOWITZER.

Mr. **Sherley.** Last year you had an appropriation for one 16-inch owitzer, to be mounted on a railroad car?

Gen. **Crozier.** Yes.

Mr. **Sherley.** What istuation is that in?

Gen. **Crozier.** The design is completed for that and the howitzer nd carriage are under manufacture. The manufacture has not proceeded very far, however, because the design has very recently been ompleted.

Mr. **Sherley.** That represents a simpler problem than the gun?

Gen. **Crozier.** Yes, it does, because the usual difference between hese two, namely, that we use the howitzer for high-angle fire and e gun for only low angle fire, will not obtain for the reason that e expect to use the gun for what might be called high-angle fire lso, that is, to as great an elevation as 30°. That will make the ownward thrust from the gun somewhat comparable to that from e mortar, making a very considerable force in a vertical direction hich will have to be taken care of with both pieces. So that the ifference in the problem will come from the fact that the mortar a less powerful piece than the gun. However, they are both quite rious problems.

Mr. **Sherley.** I simply had the layman's viewpoint, that a mortar ing fired at a higher angle made the thrust more vertical and, erefore, easier to take care of than with a gun, together with the t that it was fired at a lower velocity than from a gun.

Gen. **Crozier.** Yes. The vertical thrust, however, is not always ry easy to take care of. It is easy when you have it on something d but when you have it on something like a car it is likely to be oublesome. However, I do not want to mislead you there. These

16-inch howitzers will not be fired, probably, directly from the car. The design is that they are for railroad transportation and for quick emplacement on a platform not previously prepared, a platform or something which takes the strain off the car. I do not want to give the idea that either one of these requires a previously prepared emplacement with a platform that has to be gotten ready in advance of the time that you take the gun or the howitzer to a particular place for use. Both of them involve a certain amount of preparation after arriving at the place where they are to be used, before they can be used, but that preparation is not supposed to be made in advance.

Mr. SHERLEY. You speak of your design being completed. Therefore, you are more advanced with the mortar than you are with the gun?

Gen. CROZIER. Yes.

Mr. SHERLEY. How soon do you expect to get this mortar?

Gen. CROZIER. The forgings for this mortar or howitzer are due in August, 1917, and it is expected the howitzer itself will be finished in the following August, 1918, and everything else ought to be ready at that time.

Mr. SHERLEY. You are asking for $440,000 to build four more of these 16-inch howitzers or mortars?

Gen. CROZIER. Yes, sir; which would be expected to be built along these same lines from the designs.

Mr. SHERLEY. You do not anticipate in this instance obtaining designs from abroad?

Gen. CROZIER. It may be that I will get designs from abroad for some 12-inch howitzers—which I think there is more hope of getting—and which can be put under manufacture right away as soon as I get them.

Mr. SHERLEY. That applies, then, to the estimate you have of $360,000 for six 12-inch howitzers?

Gen. CROZIER. Yes, sir.

Mr. SHERLEY. Have you not a number of 12-inch howitzers that are available?

Gen. CROZIER. No; we have not. We have some 12-inch mortar that are not very modern pieces and probably could be spared from the places where they are, but most of them are very heavy and would not be very suitable for anything where mobility is required.

Mr. SHERLEY. So you contemplate building the carriages for these six 12-inch guns?

Gen. CROZIER. Yes; and the cars, of course.

Mr. SHERLEY. You also contemplate with the estimate submitted to spend $1,300,000 for four 16-inch guns and carriages?

Gen. CROZIER. Yes. Two of them are intended to go at Rockaway Beach and the other two will go to Puget Sound.

Mr. SHERLEY. You have already gotten the appropriation for 16-inch guns at Cape Henry and for Rockaway Beach?

Gen. CROZIER. Yes.

Mr. SHERLEY. You have already testified somewhat as to the time it is going to take to get the first of those guns?

Gen. CROZIER. Yes.

CONTRACTS FOR 16-INCH GUNS.

Mr. **Sherley**. I believe you testified last year, General, that there was no factory in America, either Government or private, equipped for building a 16-inch gun.

Gen. **Crozier**. Sixteen-inch guns of the length of these.

Mr. **Sherley**. Of 50 calibers?

Gen. **Crozier**. Yes.

Mr. **Sherley**. Have you made any contract for a 16-inch gun as yet?

Gen. **Crozier**. I have not. We expected to let a contract for two of these six 16-inch guns, but the time of delivery offered was so long that I thought that in one case we could beat the time by making the guns at the Watervliet Arsenal and in the other case what little could be gained by giving the gun out to private contract would not compensate for the increased cost.

In the case of these two guns, one company proposed to furnish one gun in 38 months and the second one in 42 months from the date of receipt of the contract. The other company agreed to deliver the first gun within 30 months from the date of the contract and the second gun within 36 months from the date of the contract. Now, if we can accept the estimates of the arsenal we ought to be able to get the last of those guns within 36 months, which is the shortest time the bids contemplated, and for less money.

Mr. **Sherley**. So you expect to make them all?

Gen. **Crozier**. We expect to make the whole six. The bids we have received indicate that if, on account of Watervliet Arsenal being supplied with work on these heavy guns for nearly the next three years, we wish to place any orders for manufacture from the funds which we are estimating for we may run into the 125 per cent limitation.

Mr. **Sherley**. How is the Navy going to get its 16-inch guns?

Gen. **Crozier**. I think they are going to make a part of them themselves and have a part of them made under contract.

Mr. **Sherley**. They are 50 calibers?

Gen. **Crozier**. Yes.

Mr. **Sherley**. And a plant capable of making their guns would be capable of making these guns?

Gen. **Crozier**. Yes. It may be that after having made some of these guns, perhaps, for the Navy, a private plant would find part of its equipment paid for, so it would not have to charge it into the cost of the guns which they might make for us, and perhaps we can, on the next trial, get a better offer, although I do not know.

Mr. **Sherley**. The Navy is going to require quite a number of these guns?

Gen. **Crozier**. Yes.

Mr. **Sherley**. How do they hope to get them supplied within any reasonable time?

Gen. **Crozier**. I do not know. I do not know what enlargements they contemplate of their own factory, and I do not know to what extent the interference of naval orders may have controlled the time of delivery which has been offered to us.

Mr. **Sherley**. Do you take up these matters with the Navy at all?

Gen. CROZIER. Yes; we do. We discuss them. As to this particular matter I do not know that we have gotten anything very definite from them, but we are in general relations with them all the time.

Mr. SHERLEY. Do you think you are going to be able to spend this money for these 16-inch guns you are asking for now?

Gen. CROZIER. I think this, Mr. Chairman: I think we can undoubtedly spend it sooner if we can get it and can start out in an effort to spend it with something definite to offer rather than if we have to make the arrangements tentatively with the expectation of getting the money afterwards.

Mr. SHERLEY. You have practically presented estimates for all the armament work that is in contemplation under the Board of Review's scheme, have you not?

Gen. CROZIER. No; the Board of Review's project contemplated completion in four years, and we are now taking the remainder of their project and estimating for one-third of the amount necessary to complete it. In addition we are estimating, as I have explained to you, for three items which were not in the Board of Review's project, and we are also making a supplementary estimate to take care of what we wanted to have taken care of last year but have not sufficient funds for.

ENTRANCE TO LONG ISLAND SOUND.

Mr. SHERLEY. General, you are also asking for $733,000 to complete within $150,000 the turrets for the guns at the eastern entrance to Long Island Sound. Are you making those turrets?

Gen. CROZIER. We are making the designs.

Mr. SHERLEY. You are not going to make them in the arsenals?

Gen. CROZIER. No; as far as the turrets themselves are concerned, we will do some of the work at the arsenal, just as we did for the Manila turrets.

Mr. SHERLEY. Of course, you will have to buy the armor.

Gen. CROZIER. Yes. It depends on the state of the work for the Navy whether we can get anybody to undertake it or not, as the work for the last turret was undertaken by the Newport News Shipbuilding Co. We have already spent about $10,000 on those turrets and about 1,800 days of work on them.

Mr. SHERLEY. Are they pretty nearly completed?

Gen. CROZIER. No; they will not be completed until next summer. We hope it will be early in the summer, but, of course, we can order some of the larger parts without waiting for the entire completion of the designs.

Mr. SHERLEY. When are you going to get those turrets finished?

Gen. CROZIER. If we can get the turrets through in three years after we get the designs finished, we will be doing pretty well.

Mr. SHERLEY. Now, General, we have gone over these items somewhat in detail. Do you believe it is possible to really use what amounts to over $9,000,000 and contract authorizations of $2,200,000 anywhere within the time that will elapse before you get a new supply of money?

Gen. CROZIER. I will not have to use the contract authorization within that time. I do not expect to be able to use all this cash that is estimated for here before I have a new supply of money; but y must remember that the new supply of money the next time is rather indefinite; I mean, after this appropriation is made at the present session of Congress it may very well not be until July, 1918, which is 18 months from now. That is quite a long time, and I think perhaps some of this money might be shifted to the contract authorization from the cash appropriation I am asking for. As things look now, it certainly could be.

Mr. **Sherley.** How did you arrive at the amount of your contract authorization as it relates to the cash—just arbitrarily?

Gen. **Crozier.** When we went over this during the autumn just past, for the purpose of making a separation, it was a very indefinite estimate; not entirely arbitrary; but in making it we kept on the safe side; and I think now, a month or two after that estimate was turned in and after some replies have been received to some of our invitations to submit proposals we could safely transfer a little of this money from the cash estimate to the request for contract authorization.

PURCHASE, MANUFACTURE, AND TEST OF AMMUNITION FOR SEACOAST CANNON, UNITED STATES.

Mr. **Sherley.** The next item is for the purchase, manufacture, and test of ammunition for seacoast cannon, and for modernizing projectiles on hand, etc. You are asking for $10,940,000, with a contract authorization of $2,000,000. Last year you asked for $3,000,000, with a contract authorization of $3,500,000. Now, this is to supply the reserve ammunition for seacoast cannon in continental United States?

Gen. **Crozier.** Yes, sir.

Mr. **Sherley.** What percentage of that contemplated reserve, as fixed by the Board of Review, have you either on hand or the funds provided for?

Gen. **Crozier.** For the armament which has been provided for to date for continental United States, I have 58 per cent of the allowance provided for. Now, for the armament which is contemplated, I have 44 per cent provided for—that is, 44 per cent of the ammunition is provided for the armament which is contemplated in the project of the Board of Review, but for the armament which has itself already been provided for, we have provided 58 per cent of the ammunition.

Mr. **Sherley.** When you speak of the armament in the project you mean existing and contemplated armament?

Gen. **Crozier.** Yes, sir.

Mr. **Sherley.** And as to that, you have 44 per cent?

Gen. **Crozier.** Yes, sir.

Mr. **Sherley.** But as to the armament that is already either in existence or under manufacture or provided for, you have 58 per cent?

Gen. **Crozier.** Yes, sir.

Mr. **Sherley.** What addition in percentage will this sum you are now asking for give?

Gen. **Crozier.** It will bring the 58 per cent up to 80 per cent, and it will bring the 44 per cent up to 60 per cent.

Mr. SHERLEY. In point of fact, it would be expended in procuring ammunition for existing armament or that about to be installed?

Gen. CROZIER. Yes, sir; largely.

Mr. SHERLEY. Did you with the moneys last year make any ammunition for the new-caliber guns not now in existence—that is, for the 16-inch guns?

Gen. CROZIER. We have not placed any orders for the ammunition for the 16-inch guns to be placed in continental United States.

Mr. SHERLEY. Now, in point of fact, your percentages vary as to the different types of guns?

Gen. CROZIER. Yes, sir.

Mr. SHERLEY. There are some existing armaments that are counted in the project of the Board of Review, but which are, in fact, more or less of secondary importance?

Gen. CROZIER. That is true; yes, sir.

Mr. SHERLEY. You are not spending any money on ammunition for such armament prior to getting up to your maximum on the more important armament?

Gen. CROZIER. These funds will be expended, first, for ammunition for guns that we know will continue to be in use for an indefinite period, and some guns, such as the 8-inch guns, for instance, that are passing into secondary importance, will be attended to last, or possibly they will not have to be attended to at all.

Mr. SHERLEY. Last year, presumably, your estimates represented one-fourth of your scheme for the reserve ammunition, yet this year they are pretty nearly twice as big. How does that come about?

Gen. CROZIER. I do not think we had one-fourth last year. Here is the way our figures stand now: The approved method contemplates appropriating for the remaining ammunition in three appropriations. Now, on this basis this year's estimate would be $7,866,000. Adding to that $3,500,000 to meet the contract authorization of last year, and adding 20 per cent to $7,866,000 to cover the difference in price, would bring the estimate up to the $12,940,000 that we have now. You see, in making your statement of this in your question you left out of consideration the rather large authorization that was carried last year in that bill.

Mr. SHERLEY. However, to the extent of making a new authorization, that is offset.

Gen. CROZIER. Yes, sir; except for $1,000,000, but I think you counted the new authorization in when you said that we had such a considerable sum this year. I counted it when I gave that set of figures. The amount of cash asked for is only $10,940,000. I do not think you will find that that was one-fourth of it. Last year we got in cash and contract authorizations, $6,500,000. Now, suppose you add that 20 per cent for the increase in price, which amounts to $1,300,000, making in all $7,800,000. We did not get a quarter of it last year. The fact of the matter is that the appropriation, including the authorizations last year was less than one-fourth of the total amount of seacoast ammunition that is in the project for continental United States.

Mr. SHERLEY. What does that total in money value?

Gen. CROZIER. The total for the armament provided and contemplated for continental United States is $42,378,000.

Mr. **Sherley.** And of that you have on hand in money value——

Gen. **Crozier** (interposing). $18,800,000 on hand or under manufacture.

SEACOAST CANNON AMMUNITION.

Mr. **Sherley.** Will you please state what proportion of all the moneys appropriated for seacoast cannon ammunition at the last session of Congress will be expended in the arsenals and what proportion with private manufacturers?

Gen. **Crozier.** For the procurement of ammunition for seacoast cannon Congress at its last session appropriated funds and authorized contract obligations to the amount of $10,300,000, of which $6,500,000 was for the continental United States, $2,200,000 for the insular possessions, and $1,600,000 for Panama. Of this ammunition 32 per cent in money value will be manufactured in ordnance establishments, and 68 per cent procured from private manufacturers. The two principal items are powder and projectiles. The powder amounts to $2,224,000, of which $700,000 worth will be manufactured at Picatinny Arsenal; the remainder of the capacity of that establishment, on a modified two-shift basis, being utilized for the production of powder for mobile artillery cannon and for small arms. The projectiles amount to approximately $5,900,000, of which $1,065,000, including royalty, will be expended in the manufacture of projectiles at Watertown Arsenal, and the remainder in the purchase of projectiles from private manufacturers. The orders placed with Watertown Arsenal will tax the capacity of that establishment, on a two-shift basis, for at least a year.

Mr. **Sherley.** There has been no change, General, in the project touching the quantity of ammunition desired for guns and mortars?

Gen. **Crozier.** No, sir; there has been no change in that project, Mr. Chairman.

Mr. **Sherley.** Has there been any change in the proportionate amount of shot and shell to be used?

Gen. **Crozier.** No, sir; there has not.

EXPERIMENTS IN FUSES.

Mr. **Sherley.** What is the status touching your fuses? Have you developed satisfactory fuses of the different types?

Gen. **Crozier.** There is one kind of fuse that may find an application in the seacoast service, particularly in the antiaircraft guns that may be used in the seacoast service, which depends for its time element on a mechanical device—a clockwork type—rather than upon a burning train of composition. We are at work on that, but have not reached a conclusion yet. In regard to the fuses for shot and shell used in the seacoast service, we have types which we think are satisfactory, in accordance with the present stage of the art, but which do not embody all the improvements which we would like to have. In other words it is not a quiescent subject.

Mr. **Sherley.** Are you conducting any experiments in connection with fuses?

Gen. **Crozier.** Yes; we are. With reference to the fuses of the class we are talking about now, we are conducting experiments with the clock fuses that I spoke of, and we are concerning ourselves with the design of a fuse that will produce greater safety for the guns; that is to say, there is a feature of the fuse which is intended to prevent disastrous consequences to the gun in case the fuse should explode prematurely while the projectile is still in the bore of the gun. I can not say that we have gotten to the end of that subject, and we have not yet adopted for manufacture a complete supply of the type of fuse which would accomplish that purpose. However, we have our standard fuse, which will detonate a projectile upon impact with an armor plate, and a standard fuse which will detonate a projectile with the determined delay after impact against an armor plate. Those fuses a few years ago represented the goal at which we were aiming; now we have a new goal.

Mr. SHERLEY. Are you learning anything from abroad touching this matter?

Gen. CROZIER. One of the things that we hear of is that in the field operations of the armies in Europe there are a great many shells that have unsatisfactory fuses in them; that is, they do not explode. As far as the fuses which are used by the seacoast artillery are concerned, I can not say that we have had any especially valuable information from abroad.

Mr. SHERLEY. There have been practicaly no modern fortifications under fire, unless you call those at the Dardanelles modern fortifications.

GEN. CROZIER. Yes; those are practically the only ones. Of course, there has been a great deal of use against ships, which is what our seacoast ammunition is designed for, and it is very apparent that some of it has been exceedingly effective.

Mr. SHERLEY. Do you use a similar fuse to the fuse which the Navy uses?

Gen. CROZIER. Yes; that is to say, we have a fuse designed to accomplish the same object. I think the Navy has issued some fuses to their service which have been more especially constructed with the view of preventing harm from premature explosion in the bore, which we have not yet issued to our service. Whether they are entirely satisfied with their fuses of that type I should not like to say. Perhaps if they are not entirely satisfied they would not like anybody to say, even if they knew it, so I think I will say I do not know.

Mr. SHERLEY. When you testify as to percentages of ammunition on hand or provided for does that mean the ammunition as completed? In other words, have you a proportionate percentage of all the component parts?

Gen. CROZIER. The statement which I made only applied to the total value of the ammunition which is on hand or under manufacture.

Mr. SHERLEY. What I am asking is whether, in point of fact, having fifty odd per cent of the total amount, that means that you have that percentage of the parts that go to make up the ammunition, the powder, shell, fuses, and so on?

Gen. CROZIER. Yes; that is so in this way: That we try to make the expenditures so as to provide for complete rounds of ammunition and not to have on hand or ordered some of the components and lacking in others.

Mr. SHERLEY. That is what I was getting at.

Gen. **Crozier.** But we have not a uniform percentage for the different kinds of guns.

Mr. **Sherley.** I understand that, and very properly have not, as developed in the examination. You still follow the practice of using the oldest powder on hand for target practice and replacing it with new powder?

Gen. **Crozier.** Yes, sir.

Mr. **Sherley.** In your target practice you do not use the regular shell?

Gen. **Crozier.** No; we use a cast-iron shell, as a rule.

Mr. **Sherley.** How much experimentation do you have, if any, to show the condition of shells that have been issued and in reserve for some time? Of course, that is a pretty expensive thing, but I was wondering whether you occasionally took a shell of an earlier date and actually fired it at Sandy Hook or elsewhere in order to ascertain whether it was in serviceable condition or not?

Gen. **Crozier.** A limited number of the war projectiles have been fired by the Coast Artillery in specially authorized target practice, but the practice is not general.

Mr. **Sherley.** Those shells are not actually fired at a target which would in any sense develop the destructive effect of their explosion?

Gen. **Crozier.** No; not by the artillery service. However, we do something of that sort once in a while at Sandy Hook, but it is usually incidental to some other work; but we have not adopted a program of testing the qualities of the projectiles by firing them at an armor plate at the proving grounds. That would be very expensive and, therefore, we have confined ourselves to the occasional examination of the condition of the explosives, which might be called a laboratory examination of them.

Mr. **Sherley.** Have you made any experiments recently with high explosives as against armor plate?

Gen. **Crozier.** Looking toward the development of a new high explosive, not very recently; no.

Mr. **Sherley.** Are you changing at all the quantity of explosive that is put respectively in your shot and shell?

Gen. **Crozier.** No. We are contemplating a change in the field shells which are loaded with high explosives and increasing the quantity, but not in the seacoast shell.

Mr. **Sherley.** General, you are not carrying this year an estimate for the alteration of the shells so as to provide long-point shells?

Gen. **Crozier.** No; I am not. That project has been carried through as far as the assignment of funds is concerned. All the projectiles requiring long-point caps have either been provided with these long-point caps, or will be so provided as soon as the work which is now in progress and which has already been appropriated for shall be completed.

Mr. **Sherley.** Last year you testified that for the use of some of the seacoast armament against land troops, where we might wish to fire shrapnel from the heaviest guns or mortars, you had not developed an entirely satisfactory fuse. Have you now?

Gen. **Crozier.** That is one of the things which I had in mind when I mentioned a while ago about the mechanical fuse that we are engaged with.

Mr. SHERLEY. But you spoke of it in connection with the antiaircraft guns?

Gen. CROZIER. I illustrated it by that, yes; because there is a similarity in the use which creates a demand for that kind of a fuse between the antiaircraft gun and the heavy howitzer, at least, or even the heavy gun, when fired at very long range. In each case a time fuse is desirable. Now, when a projectile is fired very high into the air a train of composition burns at a different rate, depending upon the altitude, and, therefore, for uniform results it is better to have something which is not dependent upon the varying density of the atmosphere at different elevations. Another thing is that the matter of getting a time train which will burn satisfactorily with the very high velocity which is used with seacoast guns of the antiaircraft type or of the ordinary type, when we are speaking of guns, is very difficult.

Mr. SHERLEY. General, you have not yet stated the condition of your Treasury balance.

Gen. CROZIER. On the 9th of December the balance in the Treasury was $2,844,444.11, and there was due under orders or contracts which had been placed, $2,767,868.43, leaving an unobligated balance of $76,575.68.

Mr. SHERLEY. Have you contracts out to the extent of your authorization?

Gen. CROZIER. Yes; except for $463,000.

PURCHASE, MANUFACTURE, AND TEST OF AMMUNITION FOR SEACOAST-ARTILLERY PRACTICE.

Mr. SHERLEY. The next item, General, is "For purchase, manufacture, and test of ammunition, etc., for seacoast-artillery practice." Last year you asked $490,000, which was an increase of $65,000. This year you are asking $572,000?

Gen. CROZIER. Yes.

Mr. SHERLEY. Is that increase due to a greater amount of ammunition or is it due to the increased cost of the ammunition, or both?

Gen. CROZIER. Most of it is to supply a greater amount of ammunition, which is needed by the increase in the number of Coast Artillery companies which have been authorized by the national-defense act. Ten per cent is then added after that increased amount is determined upon to cover the increased cost of production.

Perhaps I could make my answer plainer by saying the increase in the amount of ammunition is entirely due to the increase in Artillery troops.

Mr. SHERLEY. But the same amount of ammunition is going to cost you more than it has heretofore.

Gen. CROZIER. I have added 10 per cent for that.

Mr. SHERLEY. General, when you come to pay new ammunition for old, how do you keep your books? Do you pay back in quantity or in value?

TARGET PRACTICE.

Gen. CROZIER. In quantity. The ammunition which is provided for target practice is provided in numbers of rounds of the different kinds, and not in money value, for the seacoast artillery. It is not the same throughout the service, but that is the rule for the seacoast artillery.

Mr. **Sherley.** So that you actually supply out of the target-practice money the physical amount of ammunition that is shot away out of the reserve?

Gen. **Crozier.** Yes. We fire it away, as you say, out of the reserve and then replace it from the new appropriation.

Mr. **Sherley.** What is your balance under this appropriation?

Gen. **Crozier.** On December 9, $379,741.63, of which there was due under contracts or orders for manufacture $309,664.70, leaving an unobligated balance of $70,076.93.

Mr. **Sherley.** General, you do not always actually shoot away ammunition of just the value we appropriate for target practice, do you?

Gen. **Crozier.** Probably not, Mr. Chairman; no.

Mr. **Sherley.** Then what happens?

Gen. **Crozier.** We expend all the money that is appropriated either for targets or accessories or in the production of the ammunition, and if that results in the procurement of more ammunition than was shot away the reserve benefits from it.

Mr. **Sherley.** So you get no balances?

Gen. **Crozier.** We do not keep a bookkeeping balance and credit the next year's appropriation with what may have been left over, and we do not keep a bookkeeping balance and come to you to make good a deficit; that is to say, we think that is accurately enough provided for by the allowances that are made and the known prices of the different elements of the allowances to avoid that bookkeeping.

Mr. **Sherley.** Does much leeway occur either way?

Gen. **Crozier.** There is no great amount of leeway. There is some, I might say, for checking purposes. You have got two agencies involved in this by which to keep a watch over it. The Chief of Coast Artillery is anxious that the Coast Artillery service shall get the benefit of the practice that the appropriation allows, and the Chief of Ordnance is anxious that the expenditures for target practice shall not exceed the appropriation, and those two officials work naturally as a check on one another. I do not think there is any danger of much accumulation in this appropriation as long as the Chief of Coast Artillery is as watchful as he is now.

ALTERATION AND MAINTENANCE OF MOBILE ARTILLERY, UNITED STATES.

Mr. **Sherley.** The next item is, "For alteration and maintenance of the mobile artillery, including the purchase and manufacture of machinery, tools, and materials necessary for the work and the expenses of the mechanics engaged thereon, $1,481,000." Last year you had an estimate of $105,000, with a deficiency estimate, and you got, including the regular and the deficiency appropriations, $600,000.

Gen. **Crozier.** Yes, sir.

Mr. **Sherley.** What did you do with all that money?

Gen. **Crozier.** I applied it, or am applying it, to the alteration and maintenance of a large amount of artillery material which is in the service now. Of course you know that with the National Guard in the service of the United States along the Mexican border there are a good many more batteries in the field now than there are ordinarily. There will be, subject to demand for alteration and maintenance, 39½ regiments of Field Artillery, to which this appropriation will have to apply. They will include all of the sizes from the 2.95-inch mountain gun up to the 6-inch howitzer. In addition there will be a few batteries of 2⅜-inch guns and 5-inch guns, 15 7-inch howitzers, 8 batteries of mountain guns, and a number of 3.2-inch guns and carriages which are not in the field, and which are therefore more easily maintained. Their maintenance is included in that of the 39½ regiments. We have concluded that it takes about $30,000 per regiment to keep all of those regiments going for a year, and taking that computed sum and applying it to the 39½ regiments and adding 25 per cent for increase of price we arrive at the figure of $1,489,000 that we have put in the estimates.

Mr. SHERLEY. Are you figuring the militia regements in this?

Gen. CROZIER. Yes, sir.

Mr. SHERLEY. Why?

Gen. CROZIER. Because they are in the service of the United States, and no special appropriation is made now for their maintenance. As long as they are in the service of the United States, their maintenance will come out of this appropriation, because there is not any other.

Mr. SHERLEY. What is the matter with the militia maintenance item?

Gen. CROZIER. That ceases to apply when the batteries are in the service of the United States.

Mr. SHERLEY. Has that been cut accordingly?

Gen. CROZIER. Yes, sir; there is no longer any appropriation for the maintenance of militia armament and equipment. The appropriations to be made hereafter for that purpose are to be made annually on estimates that will be submitted, and the permanent appropriations which have been running along for a good many years have been done away with. The appropriations for the maintenance of the batteries of the National Guard that shall be made will be applicable only to those batteries which are not in the service of the United States.

Mr. SHERLEY. Did you state the value of this property?

Gen. CROZIER. The average value of the property for one regiment is about $1,557,000, so that the cost of maintenance which is provided for by this appropriation is about 5.5 per cent of the value.

Mr. SHERLEY. You used to get along with something less than 1 per cent?

Gen. CROZIER. That was when the material was not in the field: most of it was in the storehouse.

Mr. SHERLEY. And a good deal of it is now?

Gen. CROZIER. Yes, sir. There is another thing that can be said about that, Mr. Chairman: This appropriation has practically never been sufficient to cover the first charge included in the heading, and it has been necessary to do a part of the work of alteration, particularly, and charge it to manufacturing appropriations, particularly for new material that had never gotten out in the service.

Mr. SHERLEY. "Alteration" in here was never meant literally, was it? Was not such alteration as was incident to maintenance intended?

Gen. **Crozier.** That is the way I have regarded it, but you will see that the alteration of material which has been finished, even if it has never been issued to the service, and which is found thereafter to need changes, ought to be included in this item, because there is, otherwise, no way of meeting it except by special appropriations. For instance, suppose we have a good many completed batteries in store, and in the course of manufacture we arrive at something which ought to be introduced into all the new manufactures from that time on, and that is good enough and valuable enough to make it desirable, also, to introduce it into the finished batteries which are new in the sense of not having been used, but which are completed and in store. Now, the manufacturing appropriation in all probability would not meet that, particularly if the number of batteries in store in comparison with those being currently manufactured is great. So there is no way of effecting that change except from the appropriation for alteration and maintenance.

Mr. **Sherley.** You used to carry a special item to do one big piece of work of that kind?

Gen. **Crozier.** Yes, sir; but that was, of course, something special, and, as you say, it was a large piece of work. It has been completed. We have no seacoast fortifications of a similar character to that—that is to say, when we make a change in seacoast armament which is worth while, we apply it not only to guns and carriages that are actually in commission, but we apply it to those that are in a similar condition in the storehouse.

Mr. **Sherley.** The trouble is that if you carry that reasoning to its ultimate conclusion you destroy the character of a maintenance item. A maintenance item, it seems to me, although I have not thought deeply about it, should be an item looking to ordinary wear and tear and upkeep, and it ought to bear some proportion to the cost of the property to be kept up. It ought to run with reasonable regularity, with no very pronounced fluctuations, except, of course, it would increase as the cost of the property to be cared for increases or as the quantity of it increased; but if you bring into it alteration items, then there is no way of telling anything about it, because in one year there might be a new development in the making of guns that would cause considerable money to be expended in the changing of the guns in reserve, while the next year there might be none.

Gen. **Crozier.** The solution of that would be a separation of these items, and providing one for alteration and another for maintenance. It happens, as I said a moment ago, that a large part of this alteration work upon material which has not been actually in the hands of troops has been done from appropriations for new manufacture. It has been possible to do it where it has been considered worth while, and the maintenance appropriation has not been sufficient, so that most of this appropriation has been used right along as a maintenance appropriation, including repairs, of course.

Mr. **Sherley.** The amounts indicate that.

Gen. **Crozier.** I was making an appeal for having it increased so that it would include alteration also; but, perhaps, I ought to change that and make a plea for an additional appropriation.

Mr. **Sherley.** I do not know that it matters, as long as the thing is thoroughly understood each time; but it gives to this item a different character entirely and makes a different examination touching it.

Gen. **Crozier.** There is another point about this that can be stated: Part of the maintenance for this class of material is carried on through the issue and utilization of spare parts which are well understood, of course. Now, the appropriation for ordnance stores and supplies, by the wording of the act, is available for the purchase of spare parts, and that appropriation has been used to a considerable extent for that purpose in the past, owing to the lack of sufficient funds under this item. I think that that expenditure should come particularly under this item; that is, that the spare parts for the maintenance of field artillery should come under this appropriation as long as we have this appropriation.

Mr. **Sherley.** I do not like to get additional items in the bill if we can avoid it, unless it is very necessary; but the logic of it would be to have three items, one would be your item for new manufacture, the next would be items for spare parts and alterations, and a third item would be that of maintenance.

Gen. **Crozier.** Well, the spare parts ought to be maintenance, ought they not? They should be included under maintenance because the spare parts are for no other purpose than maintenance.

Mr. **Sherley.** That is, when the spare parts are literally duplicates?

Gen. **Crozier.** Yes; and that is what they are; they are duplicates made in advance in an effort to foresee the necessity for parts that that are likely to break or wear out.

THURSDAY, DECEMBER 14, 1916.

TARGET-PRACTICE AMMUNITION, MOUNTAIN, FIELD, AND SIEGE CANNON.

Mr. **Sherley.** The next item is:

> For purchase, manufacture, and test of ammunition, subcaliber guns, and other accessories for mountain, field, and siege artillery practice, including the machinery necessary for their manufacture at the arsenals.

You are asking for $1,600,000. Last year you asked for $862,500, and you got $480,000, and then a deficiency appropriation of $700,000, making a total of $1,180,000. This is for practice ammunition?

Gen. **Crozier.** Yes; and it covers both the Regular Army batteries and the school of fire and the National Guard batteries which are in the service of the United States. The deficiency appropriation of last year was for the purpose of covering the National Guard batteries that were called into the service before the defficiency appropriation was passed.

Mr. **Sherley.** How many batteries are in the service?

Gen. **Crozier.** There are now 72 of the National Guard batteries. There have been as many as 108, and the estimate and appropriation in the deficiency bill of last year were intended to cover 130, so that there was appropriated in the deficiency bill funds for the practice of 22 more batteries than the funds actually had to cover, which amounts to about $120,000; that is to say, we got an appropriation of about $120,000 more than we actually needed, as it turned out.

Mr. **Sherley.** Not only were there a less number in the field, but they were there for a less length of time, were they not?

Gen. **Crozier.** Seventy-two of them only are still there, which shows at once, of course, that at least the difference between 72 and 108 were in the service less than a year. However, you will understand that target practice is not a continuing matter which takes place regularly day by day during the year; and it is possible that all of those batteries, which have been in the service and have gone out, might have had their full annual target practice. On the other hand, it is possible they did not, and I have not had the reports yet to tell whether they have or not.

Mr. **Sherley.** How many batteries were with the Regulars?

Gen. **Crozier.** Before last July there were 36 batteries with the Regulars, and since last July, due to the organization of three new regiments, there have been 54 batteries.

Mr. **Sherley.** This appropriation was made only for after last July?

Gen. **Crozier.** Yes; so it was intended to cover 54 batteries.

Mr. **Sherley.** What are the conditions of your balances under this item?

Gen. **Crozier.** On December 9 the Treasury balance was $1,264,414.84, and there was due under contracts or orders which had been placed the sum of $900,853.52, leaving an unobligated balance of $363,661.32. Now with reference to the amount of the estimate which is made this year——

Mr. **Sherley** (interposing). First, General, have you any data which will enable you to say how much of this unallotted balance will probably be used in target practice for the remainedr of the fiscal year?

Gen. **Crozier.** As I stated a moment ago, I know that I have had $120,000 which will not be needed in the appropriation, so that the unobligated balance will be in excess of the necessities by at least that amount. It will probably be in excess of the necessities by something greater than that amount, but I have no way of telling. This appropriation, like the other appropriations in this bill, is not an expiring one, and therefore funds which are left over can be used in the following year, and I can thus use the $120,000 that I know I shall not need for the purpose for which it was appropriated, and owing to the fact that it is probable now that there will not be so many National Guard batteries in the service during the next year as the number which I have based this new estimate upon, I can reduce the estimate by a further sum in addition to the $120,000, by which I can reduce it. This year's estimates contain $725,000, based upon 130 National Guard batteries. As I stated a moment ago, there are at present only 72 such batteries in the service, and for that number only $400,000 will be required, so that the estimates which I am making can be reduced by $325,000 in addition to the $120,000, which I have just mentioned, making altogether $445,000, and thus the estimates can be reduced to $1,155,000, which will cover all the Regular batteries and 72 National Guard batteries.

I might call attention to the fact that the regular batteries include three more regiments which are to be added this year, which will mean an addition of 18 batteries and will make the total number of regular batteries 72 instead of 54.

Mr. **Sherley.** Will those 72 batteries be actually in existence or only on paper?

Gen. Crozier. They will be actually in existence, I think. The addition of regular regiments will be formed, and I suspect they will be manned. In connection with that, I can remind you of what you probably already know, that when the number of regiments, not only of Artillery but of other branches of the service, was increased by the last national-defense act the new regiments were formed in considerable part by men who were transferred from the old regiments and then both new and old regiments completed up to their strength. I fancy that the same process will be followed the next time, and that men already in the service will be transferred to the regiments still to be newly formed.

Mr. Sherley. So that, even though the recruiting should not be up to the maximum strength which the number of regiments would indicate, there will be sufficient organization to create this number of batteries?

Gen. Crozier. Yes, sir.

Mr. Sherley. General, how much practice does this allotment provide?

Gen. Crozier. The allowance of rounds of ammunition per battery is as follows: Each 3-inch field gun battery is to have 500 rounds of standard ammunition and 3,000 rounds of subcaliber ammunition—that is, musket-caliber ammunition—and 300 blank cartridges. Each mountain-gun battery is to have the same. Each 3.8-inch howitzer battery is to have 400 rounds of standard ammunition, 400 rounds of 1-pounder subcaliber ammunition, and 300 blank cartridges. Each 4.7-inch howitzer battery is to have the same as the 3.8-inch howitzer battery. Each 4.7-inch gun battery is to have the same in number as the two preceding. Each 6-inch howitzer battery is to have 500 rounds of standard ammunition, 400 rounds of 1-pounder subcaliber ammunition, and 300 blank cartridges.

In addition to the batteries which are to receive these allowances of ammunition, there is a special allowance for the school of fire, where officers are expected to do the most valuable part of the practice which teaches them the art of artillery use, from which place these officers go back to their batteries and extend the instruction to those batteries by means of the allowances which have just been given. The allowance contemplated for the school of fire is 21,400 rounds of service ammunition, 8,000 rounds of 1-pounder subcaliber ammunition, and 16,000 pounds of musket subcaliber ammunition. It is anticipated that the attendance of officers at the school of fire will be such that these rounds allowed for instruction will give about 150 rounds per student officer.

Mr. Sherley. General, this fund does not provide any ammunition for practice purposes for machine guns?

Gen. Crozier. It does not; no.

Mr. Sherley. You do get such an allowance in the Army bill?

Gen. Crozier. Yes; about 6,000 rounds.

Mr. Sherley. It does not, perhaps, properly come to you, but have you any data touching the results of this practice?

Gen. Crozier. The information which has come to me is to the effect that the practice heretofore has not been good enough, and that the allowance of ammunition has been much too small, and for that reason the allowance is in some respects increased in this estimate.

Mr. **Sherley**. Over last year?

Gen. **Crozier**. No. The allowance per battery is not increased over last year's estimate. The allowances for the school of fire has been increased over the allowance of last year, but not the allowance per officer. It is expected naturally from the increase of Field Artillery that the attendance at the school of fire will be increased. It is now too soon for the results of the increased allowance that was appropriated for at the last session of Congress to be known, so that thus far the information is to the effect that the practice which resulted on the smaller preceding allowances has not been what it ought to have been.

Mr. **Sherley**. General, you have already indicated by your statement as to the number of rounds that are furnished that part of them are subcaliber and part of them are blank cartridges. The other rounds are the regular rounds that would be used in actual warfare?

Gen. **Crozier**. The rounds I spoke of as standard rounds are the ones that would be used in actual warfare.

Mr. **Sherley**. Have you any reports or any information touching the fire of such ammunition, as to whether it comes up to expectations and whether the fire is regular and the fuses work satisfactorily, and the powder, etc., is of the proper grade and standard?

Gen. **Crozier**. I have reports about that, yes; and they are both favorable and unfavorable. The reports have not contained anything, as I remember, criticizing the powder that is furnished. They relate, where they are critical, almost entirely to the fuses. There have been some complaints of percussion fuses not operating, not causing the bursting of the shell; and there have been some complaints as to the lack of uniformity in the action of the time fuses. As far as the first complaint is concerned, we have sometimes made special examinations, and in one instance particularly I think there was the conclusion that the observation had not been correct. I suppose there do occur cases where the percussion fuses do not act and the projectiles are not exploded. That is reported in regard to the use of all percussion fuses, I fancy, in all armies. It is a very common report from the European war that many of the projectiles of the enemy do not explode.

IMPROVEMENT OF FUSES.

(See p. 133.)

Mr. **Sherley**. General, you were speaking of the reports that had come touching the action of the fuses and their failure to always function. I presume the Ordnance Department is working all the time in the way of experimentation touching the improvement of fuses.

Gen. **Crozier**. It is, indeed, most earnestly and anxiously, and I will say in continuation of what I was saying about those reports, especially with reference to the irregularity of action on the part of time fuses, that I get reports just the other way, which are to the effect that those fuses explode where they are set, and that when the irregularity is noticed it is because they are not set right, and that the fault is with the men who have the fuse setting to do, and whom it is impossible to watch in all artillery practice, of course. They are instructed, and then when certain kinds of practice take place, simulating as closely as possible the conditions of actual combat, the men can not be watched. There are not enough officers to watch everybody, and under those circumstances you have to trust to the training that has been given to the men beforehand. Some Artillery officers, the very careful and earnest ones, say that the irregularities are due to the fact that these fuses are not set right.

Mr. SHERLEY. Speaking by and large, have the reports been favorable or unfavorable to the character of ammunition that has been supplied?

Gen. CROZIER. I think, generally speaking, that they have been favorable. I will say, however, that I am satisfied myself that a greater degree of uniformity is practicable, or has become practicable, than now exists as to our fuses.

Mr. SHERLEY. You, I believe, spoke of the fact that there had practically been no complaint as to powder. Is it the same powder that you use in seacoast cannon?

Gen. CROZIER. It is the same composition, but there is a difference in the grain.

Mr. SHERLEY. Do you follow the same practice of supplying old reserve powder for practice purposes and supplying new powder for reserve in place of that so used?

Gen. CROZIER. Yes; we follow that practice.

Mr. SHERLEY. In other parts of the ammunition, the shell and fuses, do you use the old ones and supply new ones for the reserve?

Gen. CROZIER. Yes. The Field Artillery ammunition is made up in completed rounds, just like the small-arms ammunition, and the oldest ammunition is issued, which insures that the powder, the fuse, and the bursting charge shall be of the oldest manufacture.

Mr. SHERLEY. Is that true of ammunition for the largest calibers?

Gen CROZIER. Well, the largest that we have is the 6-inch, and with reference to that the shrapnel or shell is completely assembled. There is a brass cartridge case, but it is carried separate from the projectile. The projectile is first loaded and then the cartridge case is put in afterwards, but the two are packed in a box as a complete round.

Mr. SHERLEY. Are your fuses always ready for use, or are they assembled, if that is the proper word, at the time of or shortly before their use?

Gen. CROZIER. The rounds, when they are first made up, are made up with the fuses assembled to the projectile, but the time fuses have an air-tight cover so that the moisture can not get at and change the character of the time train, which cover is stripped off just before the round is loaded into the gun. We sometimes send out fuses in separate lots and have them replace other fuses that are already in the projectile, especially when we send these fuses back to have something done to them.

Mr. SHERLEY. Is that true of your ammunition that is in reserve?

Gen. CROZIER. Yes; that is true of the ammunition in reserve.

ALTERATION OF 3.2-INCH BATTERIES.

Mr. SHERLEY. General, we mentioned, in a passing way, the fact that you had no estimate in this year for the alteration of 3.2-inch batteries?

Gen. **Crozier.** Yes, sir.

Mr. **Sherley.** But that that project has been completed?

Gen. **Crozier.** Yes.

Mr. **Sherley.** How many batteries have been so altered?

Gen. **Crozier.** Thirty-four.

Mr. **Sherley.** At what cost?

Gen. **Crozier.** The total appropriations for that purpose have been $1.370,000.

Mr. **Sherley.** That represents about what saving over the cost of creating that number of new batteries?

Gen. **Crozier.** Speaking roughly, I think that it represents a saving of a little more than half the cost of the new batteries. We will get something over two of these batteries for one new one.

Mr. **Sherley.** Have you any more of these 3.2 batteries?

Gen. **Crozier.** No; all that are available for this purpose are used up now.

Mr. **Sherley.** Have you any balance under this fund?

Gen. **Crozier.** There is no balance under that fund.

Mr. **Sherley.** It is a remarkable situation that you should have just exactly made these alterations for just exactly the amount of money that we gave you.

Gen. **Crozier.** I will tell you how that comes about and you will see that it is not such a singular coincidence after all. All of these pieces require reserve parts to look out for their maintenance, and these 34 batteries that I speak of have been supplied with what we think is a reasonable number of reserve parts. So we not only have the batteries there but we have the means for keeping them going.

Mr. **Sherley.** In other words, you used all of the money that was available for reserve parts?

Gen. **Crozier.** Yes; that is about the size of it.

Mr. **Sherley.** And you have no money left?

Gen. **Crozier.** No.

ALTERATION AND MAINTENANCE OF SEACOAST ARTILLERY, UNITED STATES.

Mr. **Sherley.** The next item is:

> For alteration and maintenance of seacoast artillery, including the purchase and manufacture of machinery, tools, materials necessary for the work, and expenses of civilian mechanics and extra-duty pay of enlisted men engaged thereon, $700,000.

Last year you asked for $618,000 and you got $400,000?

Gen. **Crozier.** Yes, sir.

Mr. **Sherley.** I think that reduction was due to the fact that you had some available balances, as I recall.

Gen. **Crozier.** It must have been that, Mr. Chairman. I know that I always make a very strong plea that these estimates shall not be reduced, because even as I make them they are not sufficient to make all the improvements to the older seacoast matériel which we have on hand and which I think will be worth while; we always have to stop short of what we think would be a wise expenditure.

Mr. **Sherley.** What is the situation touching your balances?

Gen. **Crozier.** The Treasury balance on December 9 was $550,-[illegible]3.66; there was due under orders and contracts which have been placed the sum of $466,615.17, leaving an unallotted balance of $83,717.99.

Mr. SHERLEY. This is a general maintenance item?

Gen. CROZIER. Yes; it is a little more than a maintenance item, as we were saying yesterday.

Mr. SHERLEY. It takes care of property of what value?

Gen. CROZIER. $36,680,000, so that the cost of maintenance alone, as distinguished from the alteration which is made from time to time for the purpose of improvement, amounts to about half of one per cent of the value of the property which is maintained.

Mr. SHERLEY. General, do you with this fund make any alterations of considerable magnitude?

Gen. CROZIER. I do; yes, sir; but when that is the case I generally make special mention of it. For instance, we have recently been making an alteration in the carriages of the disappearing guns mounted in the seacoast fortifications which is intended to increase the elevation of the guns, in most cases from 10 to 15 degrees. That was a special job made, however, under this appropriation, but it was specially mentioned. Now, in the estimate I am submitting to you to-day I have another one of the same kind.

IMPROVEMENTS, SEACOAST ARTILLERY MATERIAL.

Mr. SHERLEY. First, let me ask you this: Last year did you do anything in the way of special alterations?

Gen. CROZIER. In addition to this work we have just been speaking of?

Mr. SHERLEY. Yes.

Gen. CROZIER. I did a good deal of this work——

Mr. SHERLEY (interposing). I mean in addition to the alterations relating to the elevation of the gun carriages.

Gen. CROZIER. There have been certain improvements in some parts of the coast artillery material which we though ought to be made on practically all of the guns that have been installed. Col. Rice reminds me that some of them applied to the 15-pounder seacoast carriages and some to the 12-inch carriages. They have been running right along for some years, and they might be called distinct jobs, but they are not distinct in the sense that I have especially brought them to your attention or had a sum particularly provided for them in the appropirations made.

Mr. SHERLEY. What is the method followed in ascertaining what alteration and maintenance is necessary in connection with seacoast armament?

Gen. CROZIER. As far as the behavior of the material is concerned, we are informed in regard to it, first, by the firing that is always going on at the proving grounds in proving standard ammunition and testing new ammunition, new guns and gun carriages, and in addition we receive reports on the target practice from the Coast Artillery. Now, those processes bring to our attention what might be called casual opportunities for improvements. In addition to that there is a class somewhat like that made by the increase of elevation, which is brought to our attention by what might be called the general progress on the subject of artillery construction and use.

Mr. **Sherley.** I appreciate that; but that is not what I am trying to get at. I understand, for instance, that an alteration in the elevation of gun carriages made to meet a particular situation touching ranges would come about through the determination of a policy here; but what I am trying to get at is the method pursued if there is something wrong at a particular battery. For instance, if there is under the carriage a sufficient sinking of the emplacement or foundation to bring it out of level and to interfere with the proper use of the gun or mortar, as I understand it, that would come to you through the report of an Artillery officer.

Gen. **Crozier.** That is one way. The Artillery officer, of course, would report that, and if it related to armament it would come to me through the regular channel, or, if it related to the fortifications proper, it would go to the Engineer Department, or it would go to the Signal Corps if it related to material that they supplied. Now, there is another way besides, and that is that the entire seacoast is divided up into what we call armament districts. We have an officer in each one of those armament districts—that is, I have one officer for each district, who has that district under his special charge with reference to the point you are mentioning. He has other duties, of course, because this work is not sufficient to take up his whole time. It is the duty of that officer to inspect this material periodically and to catch all of those matters of the kind you have illustrated. For instance, the district of the north Atlantic coast, or the north Atlantic part of it, is under the charge of the officer who is in command of the Watertown Arsenal, which is the seacoast gun carriage factory. He or one of his officers detailed for the purpose makes periodical inspections of the armament in that district.

Mr. **Sherley.** There have come to me at different times and from various sources statements as to the condition of the armament in certain fortifications—statements that, if they were accurate, would present a rather serious condition touching that armament. I am not speaking now of its inadequacy for the protection of the particular place that it is supposed to fortify, nor of any moot questions as to the character of the armament that should be had, but as to the condition of the actual armament itself to perform the functions for which it is created. Could a condition of that kind exist without the knowledge of those ordnance officers whose duty it is to inspect that ordnance?

Gen. **Crozier.** It ought not to be possible; no, sir.

Mr. **Sherley.** I understand that there is semiannually made a physical inspection by ordnance officers of the armament at all of the fortifications in continental United States.

Gen. **Crozier.** That is true; yes, sir; and the same thing is true of the insular possessions and Panama.

Mr. **Sherley.** Is that examination made in connection with the actual use of the guns in target practice?

Gen. **Crozier.** An effort is made to do that. The officers have instructions, whenever it is practicable, to have our inspections coincide with one of the occasions of target practice; and, also, as we inspect all the armament, we inspect those guns which are out of commission, with which target practice is not held.

Mr. SHERLEY. In the inspection of those guns are they actually operated—not by the firing of projectiles—but are they put through the same movement that would take place when they were actually in use, so as to see that the gun and carriage function?

Gen. CROZIER. Yes, sir; that is done and a special report made about every detail.

Mr. SHERLEY. Of course that would not show, as only an actual firing could show, whether the guns and carriages were in a condition to stand the strain of the fire and recoil, etc.

Gen. CROZIER. Yes.

Mr. SHERLEY. I presume that is assumed to be the case in the absence of any physical defect showing in the gun or carriage?

Gen. CROZIER. Yes; that is true. I may add that when each gun is mounted it is proved in its emplacement; that is to say, before the guns are turned over to the Artillery they are actually fired a certain number of rounds in order to see that everything is all right. Then if they are not thereafter fired, as some of them are not, because they are in places where target practice can not be advantageously held, or where it would be dangerous to surrounding property to hold it, ordinarily speaking, there is no reason for supposing they can become so damaged or worn that they would not endure the strain of firing. It is possible they may be allowed to rust, or it is possible the packing may be allowed to get hard, so it will not hold the oil in the cylinders, or something of that sort may happen; but a thing of that kind is subject to immediate remedy on the spot by placing the thing in order.

Gen. WEAVER. That would be due to failure of the personnel also.

Gen. CROZIER. Yes; it would probably be caught in the first place by the artillery commander. If not by him, by the ordnance officer who inspects the armament and tries it out in every way except by firing.

Mr. SHERLEY. Is the inspection of the ordnance officer sufficient to ascertain whether there has been any change in alignment—if that is the proper word—or whether there has been such a sinking of the platform as to make the fire of the gun inaccurate or to make it impossible to fire it?

Gen. CROZIER. It is of such a character. The officer is required, among other things, to cause the gun to be traversed in azimuth and moved in elevation, and in case it is a disappearing carriage to be retracted from the firing to the loading position and allowed to rise from a loading to a firing position. From time to time there is a test made of the accuracy of the elevation graduations; that is to say, a test is made to show that when the gun is set, we will say, for 9° elevation, for instance, the axis of the piece shall actually be inclined at an angle of 9° with the horizontal.

Mr. SHERLEY. Is the ammunition loaded and unloaded in the gun, even though the gun be not fired, so as to see that there is nothing wrong in that regard?

Gen. CROZIER. That is done habitually by the Artillery in practice, and it is done at times in inspection. Whether that is prescribed as part of the regular inspection, I do not remember; I doubt if it is. I can not imagine what change could take place so that a gun which might be loaded at one time could not be loaded at another time.

MAINTENANCE AND ALTERATIONS OF EMPLACEMENTS.

Mr. **Sherley.** Col. Winslow, you have heard the testimony of Gen. Crozier touching the practice of the Ordnance Department in detailing officers for periodical examination of the condition of armament. You also have officers of the Engineer Corps who expend the funds for maintenance and alteration in connection with the emplacements at these fortifications. Do you follow a similar practice touching inspection by those officers?

Col. **Winslow.** The district engineer officers are supposed to go over the fortifications under their charge at frequent intervals. They visit the fortifications and also consult with the post commanders and learn promptly of any complaints, and investigate them promptly.

Mr. **Sherley.** If anything is wrong with the platform upon which a gun or mortar rested so as to throw it out of horizontal, would that be a matter that would come to the attention of the Engineer officer?

Col. **Winslow.** That would come to the attention of the engineer officer promptly. It would be the duty of the commanding officer of the battery concerned to report it, and it would be investigated. We have in fact periodical reports that certain batteries are to a certain extent out of level. This is particularly true, for instance, of the forts at the mouth of the Mississippi River. Those forts were built over 20 years ago and are still slowly settling. As they settle the gun platforms, or rather the base rings, get out of level. When a base ring is sufficiently out of level to interfere with the firing of the gun it is taken up and releveled, and in order to provide for further settling it is releveled a little bit the other way, so that just after it has been leveled it is a little out of level one way, but not so much so that the gun can not be fired and not so much as to affect the accuracy of target practice. As the settling goes on the base ring passes through a condition when it is absolutely level, and then goes on beyond that until releveling is again necessary.

Mr. **Sherley.** Allowance can be made for a slight variation from true level so as to make the firing as accurate as if the gun was on a true level?

Col. **Winslow.** Yes, sir; and that is done.

Gen. **Weaver.** That is constantly done.

Mr. **Sherley.** That is done usually by marking at the gun the variation that should be made?

Gen. **Weaver.** There is marked on the base ring the amount, plus or minus, to be added to the range.

Mr. **Sherley.** Do the engineer officers see the reports of the ordnance officers and do the ordnance officers see the reports of the engineer officers touching the physical condition of various fortifications?

Col. **Winslow.** As a rule they do not.

Mr. **Sherley.** Suppose a matter is reported by the engineer officer which, upon consideration, would seem to involve an ordnance matter, is that referred over to the ordnance people?

Col. **Winslow.** Promptly.

Mr. **Sherley.** So that an observation by an officer as to anything that is wrong, even though it be outside his jurisdiction, is referred so as to receive attention from the proper officer whose duty it would be to remedy the matter?

Col. WINSLOW. Yes, sir.

Mr. SHERLEY. That is true of the ordnance officers in case an engineering proposition comes to their attention?

Gen. CROZIER. Yes, sir.

Mr. SHERLEY. Gen. Weaver, reports that are made by a district officer as to anything that may be wrong touching the batteries are immediately referred either to the engineers or to ordnance?

Gen. WEAVER. As soon as a matter comes to our attention it is referred to the department concerned.

Mr. SHERLEY. General, when a report is made by an Artillery officer containing a complaint as to conditions surrounding a battery, that report, before action is had, is reviewed by the superior officers in the Artillery Corps?

Gen. WEAVER. It is; yes.

Mr. SHERLEY. Is that review made before a reference of the matter to Ordnance or Engineers, as the facts may warrant, or only after such reference?

Gen. WEAVER. Reports of coast defense commanders are forwarded through the district and department commanders to the War Department, and these officers have an opportunity to review these reports before their receipt in the War Department.

Mr. SHERLEY. But the point I am making is this: Suppose a report is made by a district officer that a gun is out of level; it comes on up to the superior officers in the Artillery. Do they undertake to pass upon the need of a change being made there without a report from Ordnance or Engineers or after such report?

Gen. WEAVER. Without any reference, in the first instance; that is, they would recommend that the change be made or not made, as they forward the report.

Col. WINSLOW. I might say, Mr. Chairman, that the district officers are in such close touch with the coast defense commanders that matters of that kind reach the ears of the district engineer officer ordinarily before they are ever heard of in Washington. All minor matters are corrected at once, and it is only matters of comparatively great import, requiring funds greater than the maintenance sums in the hands of the district officers, that come up to Washington at all.

Mr. SHERLEY. Gen. Crozier, you have asked for varying sums in years gone by under this heading. I assume, in this instance as in many other items touching maintenance and alteration, there are on your desk requests that would involve a very much greater expenditure than that which you ask to be authorized to make during the year.

Gen. CROZIER. I could not say that that is the case, but there are in my office memoranda as to improvements which might be made that would call for a great deal more money than those that are in my estimates each year. Whether those memoranda come through requests from people who are in direct contact with the armament, either the Artillery officers who are using it or the Ordnance officers who are inspecting it and keeping it in repair, I can not quite say now.

Mr. SHERLEY. General, there is manifestly a distinction between an alteration which is for the purpose of making a more efficient weapon and such alteration as might be strictly in the nature of repair, because of some defect existing in the particular piece or its carriage. As to the latter, when such matters come to the Ordnance and are approved by them, do you ask for moneys sufficient to take care of them?

Gen. CROZIER. Yes; if I do not have the money already available. There have been instances of the kind occurring comparatively recently down at Panama. When we first installed the mortars that are there now and commenced to fire them, we found to our surprise that a certain breakage occurred in the carriage. It had not occurred in the extensive trial of this type of mortars and carriages at the proving ground; but we immediately went to work to remedy it both with regard to those that had already reached the Canal Zone and with regard to those which were still to follow. We have had, comparatively recently, brought to our attention failures in a part of the elevating mechanism of the 14-inch disappearing gun carriages that are at Panama. We went at that immediately and ascertained that the failure was due to two causes. In the first place, the metal in this particular part of the elevating mechanism was defective in a way that had not been theretofore suspected and which was not disclosed by the usual tests which had been applied to such metal. The metal was particularly sensitive to shock, as distinguished from weakness against tensile strength. Its composition was all right, and the conclusion was that the particular sensitiveness had resulted from what is called the heat treatment of this particular metal. The metal was subjected in this mechanism to a certain shock in the ordinary operation of firing the gun. We proceeded to remedy both matters; to substitute new parts made of different steel, to which was applied a new test as to resistance to shock; and a device has been designed and successfully tested at the proving ground whose object is to cause the shock to cease. So that we have remedied that along both lines, and we did that, of course, at once. We happened to have money that was applicable to it, and we did it. I use those for purposes of illustration. In any similar case we would always either use the funds that we had available for remedying the matter or ask for additional funds. And I may say that no case has arisen yet where we have not had funds available and where we have had to wait until we could secure funds by a new appropriation.

Mr. SHERLEY. It would follow, General, from your statement, then, that assuming your inspection and that of district officers in the Artillery and in the Engineers to be thorough, and that their reports are properly acted upon, the armament now in our seacoast fortifications should be in a condition to properly function to the extent that was originally intended at the time they were emplaced?

Gen. CROZIER. That should be the case, Mr. Chairman; yes, sir.

Mr. SHERLEY. Do you believe it to be the case?

Gen. CROZIER. I believe it to be the case; yes, sir.

Mr. SHERLEY. Gen. Weaver, are there any inspections other than these which have been indicated here by the district Artillery officers and the ordnance and Engineer officers?

Gen. WEAVER. Yes. In addition to the inspections made by the ordnance armament officer, the district engineer officer, and the coast defense officer, there are inspections made by the Coast Artillery district commander of all the defenses in his district, and by the department commander of those in his department; and then in addition to these the regular inspector of the Inspector General's Department makes his inspection.

Mr. SHERLEY. What does his inspection consist of?

Gen. WEAVER. It consists of an inspection of all United States property and of the discipline and training of the personnel. It is the most general inspection that is made.

Mr. SHERLEY. Gen. Crozier, we have been talking largely about inspection of the guns and carriages and emplacements. I gather that your ordnance office also makes an inspection of ammunition?

Gen. CROZIER. That is included in his duties; yes, sir.

Mr. SHERELEY. Not only of the shell, but of the powder also?

Gen. CROZIER. Yes, sir. We have a very elaborate system for the detection of the commencement of deterioration of powder, involving segregation of samples and the periodical examination of those samples, so that it is not left to the powder to manifest its condition in such a manner as would necessarily be observed; but initiative is taken and means are employed by which if deterioration commences it shall certainly be detected. In addition to that, when the ammunition is used in target practice something is done whic his not necessary for the target practice; that is the pressure which is given by the powder is measured and a report of that pressure is made to higher authority and comes to my office. So that if the means adopted for detection by observation of samples of a change in the powder are not sufficient, the actual performance of the powder is ascertained and recorded at the practice itself.

Mr. SHERLEY. General, you are asking for $700,000 this year, which is a larger sum than has been asked for for a number of years. What do you contemplate doing with this money?

REPAIR AND MAINTENANCE OF GUNS.

Gen. CROZIER. I expect to use $170,000 of it for what might be called ordinary repair and maintenance, exclusive of the purchase of cleaning and preserving materials; that is to say, oil, emery paper, waste, and that sort of thing. I expect to use $70,000 for the relining of guns which need relining. I expect to use $40,000 for the procurement of spare parts for guns. I expect to use for the alteration, improvement, and modernizing of all the guns except certain 14-inch guns $256,000. With special reference to 14-inch guns, I expect to use $24,000 for increasing the range of elevation of four 14-inch guns on disappearing carriages from 15° to 20°. That makes $560,000, and that, with the addition of 25 per cent, will make the $700,000 that I have in the estimate.

Mr. SHERLEY. You spoke of $70,000 for relining guns?

Gen. CROZIER. Yes.

Mr. SHERLEY. Please state the number and caliber of the guns that you expect to reline.

Gen. CROZIER. It is proposed to reline seven 12-inch guns.

Mr. SHERLEY. It is necessary to remove these guns and send them to the arsenal for relining?

Gen. CROZIER. Yes, sir.

Mr. SHERLEY. What provision, if any, have you for the substitution of other guns when these are removed?

Gen. CROZIER. We have a certain number of spare guns of certain calibers, but not enough for the purpose. We have a plan, after consultation with the Chief of the Coast Artillery, for the replacement of guns which need it by reason of having the rifling worn or partly worn. It involves two kinds of action. When a gun in the continental United States has been fired a number of rounds, such as to use up approximately half of its accuracy lift, that gun may be transferred to an interior fortification which is not so important and where the allowance of ammunition is such as to contemplate that the accuracy life of the gun will not be needed even in war, or such a gun may be transferred to an obsolete or obsolescent fortification. Another transfer that may be made of such a gun is with some gun from a post in the inner line of defense where target practice is not held on account of the position of the battery, or the gun may be changed with some post in the outer line of defense where target practice is not permitted, all of this, you will note, being under the supposition that it has about just half of its accuracy life left, which would be sufficient to use up all the allowance of ammunition.

Mr. SHERLEY. But those are not cases of relining at all. Those are cases of transfer in order to obviate the necessity of relining.

Gen. CROZIER. Exactly, and they can be made to a very considerable extent. Now, when a gun in an outer line of defense has been fired more than half its accuracy life the project contemplates sending a replacing gun there but holding that worn gun still in use and firing it until its accuracy life is about exhausted and then putting a new gun there in its place, and sending it back to the factory for relining. That is considered safe because if the replacing gun is there it can be mounted quickly, even in case of war coming along.

Mr. SHERLEY. In that instance you postpone the relining until the gun is actually used up?

Gen. CROZIER. Yes.

Mr. SHERLEY. Having, however, on hand a gun from the time the accuracy life of that gun has been sufficiently shortened to make desirable a new gun in case hostilities should then begin?

Gen. CROZIER. Yes, sir. By that program we expect to avoid the relining of guns until they are worn out.

Mr. SHERLEY. That program, however, necessitates either having on hand spare guns or the creation of such spare guns as to be able to have them on hand.

Gen. CROZIER. It does; yes, sir. I have a statement of the guns now available for such purpose and the number that will still be required in order to have on hand guns as spare guns to permit us to carry out that kind of a program. There will be needed two 4.7-inch guns, fifteen 6-inch guns, eighteen 12-inch guns, and ten 14-inch guns, and these numbers cover not only the United States but all of the outlying places. All of these guns will have to be estimated for.

Mr. SHERLEY. Right at this place would it be practicable, without too much labor, to insert a table showing the cost of emplacement of guns and carriages of the different calibers?

Caliber and kind.	Cost of gun and carriage.			Cost of emplacement, proportionate to 1 gun.	Grand total cost per gun.
	Cost of gun.	Cost of carriage.	Total cost of gun and carriage.		
3-inch barbette	$3,500	$5,000	$8.500	$16,000	$24.500
3-inch antiaircraft	4,000	6,000	10,000	1,500	11,500
6-inch disappearing carriage	6,500	24,000	30,500	75,000	105.500
6-inch barbette carriage	6,500	18,000	24.500	75,000	99,500
12-inch barbette, 30° elevation	37,000	55,000	92,000	140,000	232,000
12-inch disappearing carriage	37,000	65,000	102,000	200,000	302,000
14-inch disappearing carriage	60,000	85,000	145,000	200,000	345.000
12-inch mortar	12,000	17,000	29,000	70,000	99.000
16-inch mortar	30,000	40,000	70,000	100,000	170.000
16-inch disappearing carriage	150,000	175,000	325,000	280,000	605.000
16-inch turret (2 guns)	[1] 300,000	[2] 1,050,000	[2] 1,350,000	[1] 700,000	[1] 2,050.000
14-inch turret (2 guns)	[1] 120,000	[2] 584,000	[2] 704,000	[1] 500,000	[1] 1,204,000

[1] Total cost per turret with 2 guns.

[2] Includes proportionate cost of turrets.

SEACOAST CANNON, INSULAR POSSESSIONS.

(See p. 158.)

Gen. Crozier. For the insular possessions and Panama, where the allowance of ammunition is designed to equal the full accuracy life of the guns, the program contemplates a spare gun for each two guns mounted with an exception, and the exception is that as there is a prospect of certain 12-inch guns becoming available by reason of the falling out of use of certain old fortifications in the United States it is not believed necessary at present at least to provide spare 12-inch guns for the outlying possessions.

Mr. Sherley. Was this program within the estimates of the Board of Review?

Gen. Crozier. No, sir; it was not.

Mr. Sherley. So that to the extent that moneys will be needed for it the Board of Review's $96,000,000 program will have to be added to it?

Gen. Crozier. Yes. Now, there is another point with reference to this, and that is with reference to the 16-inch guns. There not being very many of them and their life being shorter, and it being difficult to move them about, there should be provided, we think, a spare 16-inch gun for each locality where there are 16-inch guns.

Mr. Sherley. You have been speaking of guns as meaning the piece?

Gen Crozier. The piece itself.

Mr. Sherley. And not the carriage?

Gen. Crozier. No. We expect to be able to keep the carriages indefinitely in use by making certain provisions for spare parts, which I have spoken of from time to time in the hearings. Then you will notice also from the list of spare guns required, which I gave to you, that there are no mortars contemplated. The reason for this is that the life of a mortar is so much longer than that of a gun that we do not think there is any necessity for now providing spares in the program.

Mr. Sherley. Have you estimated what the total cost of this scheme of spare pieces will amount to?

Gen. Crozier. Yes. For continental United States it ought to amount to $393,800; for the insular possessions to $737,100, and for Panama $484,700. These figures, however, are exclusive of the 16-inch guns.

Mr. SHERLEY. General, you spoke of $70,000 for relining. Did you mean that or did you mean for the transfer of guns?

Gen. CROZIER. I meant for the actual work of relining the guns, putting in new linings.

Mr. SHERLEY. In those cases you are going to substitute guns from the interior line of defenses and at places less strategically important?

Gen. CROZIER. Yes.

Mr. SHERLEY. That will leave, during the time that is necessary for the relining of these guns, those inner lines at these less important places minus guns?

Gen. CROZIER. When I spoke of a transfer I meant this kind of process: I am supposing that there will be at one of the inner lines a practically new gun and that at the outer line there will be a gun of the same caliber which will have approached the end of the first half of its accuracy life. Now, we can exchange those guns very readily.

Mr. SHERLEY. But that would not involve any relining?

Gen. CROZIER. No.

Mr. SHERLEY. But you said, in answer to an express question, that this was an actual case of relining?

Gen. CROZIER. Yes; it is.

Mr. SHERLEY. Those guns that are to be relined will have placed in lieu of them guns that come from an interior place; that is, in those cases where you may not have spare guns in reserve?

Gen. CROZIER. That will have to be done, yes, although I hope to have spare guns.

Mr. SHERLEY. Have you any spare guns to replace the guns that you are going to reline?

Gen. CROZIER. I think we have most of them for the guns which have to be relined now. We have, for instance, seven spare 12-inch guns, but one of these is in the Philippines; and it will probably be necessary to leave some interior fortification for a time without one gun, as all the guns to be relined are now mounted in the United States. In this relining work the forging would be prepared in advance, and hence the actual time the gun would be away from the fortification would be from six to eight months.

SAN PEDRO.

(See pp. 7, 31, 100.)

Mr. SHERLEY. Now, General, one of the other items that you contemplated was the alteration of the carriages for the 14-inch guns so as to permit of a 5° increase in elevation. At what points are these guns?

Gen. CROZIER. These are in continental United States, and I think they are all intended for San Pedro.

Mr. SHERLEY. Those guns are not yet in commission?

Gen. CROZIER. That is true.

Mr. SHERLEY. This alteration will require a great deal of time?

Gen. CROZIER. It will cost about $6,000 a carriage and will take a number of months.

Mr. SHERLEY. In the meanwhile, do you propose to go ahead with the mounting of these guns and then turn them over to the Artillery, or is the date of turning over the guns to the Artillery going to be delayed for the length of time necessary to make this alteration?

Gen. CROZIER. We will go ahead and turn them over and the alteration can be made afterwards by applying new parts to the carriages in place.

Mr. SHERLEY. You are making the new parts at the arsenals?

Gen. CROZIER. Yes.

Mr. SHERLEY. They will then be sent to the fortifications and the transfer made there?

Gen. CROZIER. Yes; just as is being done in the case of the 12-inch gun carriages, which are now being altered.

Mr. SHERLEY. So that there will be no delay in putting into commission the armament at San Pedro.

Gen. CROZIER. None occasioned by this, unless it should so happen that we would have parts to apply to one of these gun carriages at the exact time when it is being erected.

Mr. SHERLEY. But that would not be a delay?

Gen. CROZIER. No; of course not.

Mr. SHERLEY. Is the need for this the result of a decision by the Board of Review?

Gen. CROZIER. I do not remember that that has been passed on by the Board of Review. I think not, except in this way: That the Board of Review has decided that all new armament of this character to be installed should be such that the guns would be capable of firing at an elevation of at least 30°.

Mr. SHERLEY. So that inasmuch as they have determined that in the future guns should have a possible elevation of 30° you have, to the extent permitted by carriages which have already been built, determined upon an alteration increasing the elevation, and, in this instance, as in the instance of the 12-inch gun carriages, it amounts to 5°?

Gen. CROZIER. Yes.

Mr. SHERLEY. Are these guns to be so mounted at San Pedro as to permit of any depression?

Gen. CROZIER. Col. Rice reminds me that after this alteration these guns can be fired at a depression, so that they will have a range of elevation at least of 25°.

Mr. SHERLEY. If the guns did not have to be depressed at all, could an alteration be made that would increase their elevation by 10°, or would they have, if mounted without any depression and with the carriages in their present form, an elevation of 20°?

Gen. CROZIER. To answer such a question it would be necessary to make what we call a layout on a drawing board, but I can say this, that those carriages having been designed for 15° elevation, even if it were found practicable to so change the motions that the gun might be elevated to 25°, it probably would not be safe to fire it at that elevation, because the downward thrust on the carriage in that case would probably be more than it ought to be called on to endure.

Mr. SHERLEY. What is the extreme range of those guns fired at 15 elevation?

Gen. **Crozier.** With a projectile of full weight at that elevation the range is 19,000 yards. A heavy projectile for that caliber, according to the heaviest practice of any artillery service in the world, or just as heavy, is 1,660 pounds. A very serviceable projectile 400 pounds lighter than that might be used, in which case the range would be increased beyond 19,000 yards, which is a longer range, so far as we have been informed, than is usefully employed in the present war.

Mr. **Sherley.** Now, that your are increasing the elevation 5°, what increase in range will you get with the same projectile?

Gen. **Crozier.** About 3,800 yards, making the range about 22,800 yards.

Mr. **Sherley.** Is it believed that the increased range is of sufficient value to warrant this alteration?

Gen. **Crozier.** Well, Mr. Chairman, I think it is of sufficient value to remove it from the region of difference of opinion.

Mr. **Sherley.** The cost not being very great?

Gen. **Crozier.** The cost not being very great, it being a reasonable percentage of the original cost.

GENERAL ALTERATIONS AND MODERNIZING.

Mr. **Sherley.** Your largest item is for alteration and modernizing, and that consists of what, in a general way?

Gen. **Crozier.** A considerable item included in the total for alteration and modernizing, Mr. Chairman, is one for the regraduation of range scales of the gun carriages to meet the change which we have made in the projectile, which has been completed with funds already allotted, the change being to attach to them long, pointed caps, so as to increase the range and increase the striking velocity by diminishing the resistance of the air. This produces a change in the path of the projectile, so that a different elevation is necessary in order to attain the same range as that which was formerly used, necessitating a regraduation of the scales.

Another change will be one in the recoil mechanism of certain of the older 8-inch and 10-inch disappearing carriages, for making corrections as they are shown to be needed. Then there is a series of changes, such as making improvements in the firing circuits and alteration of the shot trucks, applying a dimming device to the cross wires of some of the telescopes that are used, changes in the wiring of some of the lamps used to read the scales in the night and for other purposes, and alteration in the traversing and in the elevating gear of some of the gun carriages, so as to permit a finer adjustment, making it easier. There are a number of items like that and a still greater number which I might detail and which will require funds not estimated for.

Mr. **Sherley.** You have estimated for all that you think is pressing?

Gen. **Crozier.** Yes, sir; I think so.

PROVING GROUND, SANDY HOOK, N. J.

CURRENT EXPENSES.

Mr. **Sherley.** General, the next item is for the current expenses or the ordnance proving ground at Sandy Hook, N. J., comprising the maintenance of rail and water transportation, repairs, alterations, etc. Last year you had an appropriation of $75,000, which was an increase over the amount that you had had for some years, due, if I recall aright, to the expectation that there would be additional officers and men and a larger amount of work?

Gen. CROZIER. Yes, sir.

Mr. SHERLEY. How are you going to come out with the fund?

Gen. CROZIER. I think that even for the work that is now going on at Sandy Hook this appropriation will not be sufficient to cover it, and I will have to piece it out, when I am permitted by the language of the appropriations, by certain funds allotted from the appropriations for the material itself. Since that is likely and since we are also certain to have still more work at the proving ground during the year that these estimates are intended to apply to, I have increased the estimate, as you see, by 20 per cent.

Mr. SHERLEY. How are your balances?

Gen. CROZIER. The Treasury balance on the 9th of this month was $53,366.33, and there was due on contracts and orders placed $25,973.53, leaving an unallotted balance of $27,392.80.

EXPENSES OF OFFICERS.

Mr. SHERLEY. The next item is for the necessary expenses of officers not occupying public quarters at the proving ground, while employed on ordnance duty, etc. You are asking this year the same amount you asked last year, and I presume for the same reason, the increase last year having been made owing to the detail of an increased number of officers.

Gen. CROZIER. Yes, sir, and I hope that will be enough to get through with. Mr. Chairman, I think there has been a still further increase of the kind of expenses that would draw on this appropriation. Now, as I said before in my testimony of yesterday, it is expected that some 30 line officers will be detailed for instruction at the proving ground ,and some of them will be used in such a way that they will draw on this appropriation; but, as I said yesterday, we have not got the 30. We have only 8, and I think, perhaps, we will be able to get through the following year without increasing this appropriation. I hope so.

PURCHASE, MANUFACTURE, AND TEST OF SEACOAST CANNON, INSULAR POSSESSIONS.

(See p. 154.)

Mr. SHERLEY. General, the next estimate that you are interested in relates to the insular possessions, and is for the purchase, manufacture, and test of seacoast cannon. You are asking $479,000 in cash and $59,000 in authorizations. Last year you had $240,000 in cash and a contract authorization of $300,000 with which you expected to procure eight 12-inch carriages especially designed to permit the high elevation of the guns, and which it was estimated would cost $440,000, and 10 antiaircraft guns at a cost of $100,000. The year before that you had $110,000, which was to complete certain mortars and carriages—that is, to complete four 12-inch mortars and carriages for Caballo Island, in the Philippines. Have those mortars and carriages been completed?

Gen. CROZIER. Yes, sir; that work has all been done.

Mr. **Sherley**. Have they been installed?

Gen. **Crozier**. I do not think they are in place.

Mr. **Sherley**. Have they been shipped?

Gen. **Crozier**. Yes, sir.

Mr. **Sherley**. How long ago?

Gen. **Crozier**. As to the dates, the mortars were shipped September 13, 1916; the carriages were shipped, one each July 24, September 7, September 19, and September 29, 1916.

Mr. **Sherley**. Have you any data as to when they will be installed or will be ready to be turned over to the Artillery service?

Col. **Winslow**. I can not tell you. The batteries are ready for the armament.

Gen. **Crozier**. In that case they ought to have them in a very short time.

Mr. **Sherley**. With the exception of those 12-inch high-angle fire guns that you got money for last year, all of the approved project for the Philippines has been completed?

Gen. **Crozier**. No, sir; there are the antiaircraft guns.

Mr. **Sherley**. I meant to include them. I meant that all of the armament that was to go into the Philippines defense has been not only provided for, but actually made and shipped, with the exception of these 12-inch high-angle fire guns and the antiaircraft guns.

Gen. **Crozier**. Yes; that is correct.

Mr. **Sherley**. General, what have you been able to do with this $540,000 of cash and authorization which you had last year?

Gen. **Crozier**. We have been able to place orders or contracts for all of the work that was covered by that estimate, except two of the 12-inch carriages. The funds were not sufficient to cover those because of various things that have occurred to increase the cost—the rise in prices, the munitions tax, and the increased leave to employees, etc. So that I have had to submit a supplemental estimate to cover those two carriages, which amounts to $138,000, which I think you have received.

Mr. **Sherley**. This $138,000 is expected to complete the work on these carriages?

Gen. **Crozier**. Yes; it is expected to complete the program that was presented to you last year. I can state what else is expected to be done with this estimate if you would like to hear it at this point.

Mr. **Sherley**. Before we come to the rest of the estimate I want to find out just what the situation is touching these carriages and touching the antiaircraft guns. Are you able to build those guns or are they under contract?

Gen. **Crozier**. The guns themselves have been ordered at the Watervliet Arsenal. The carriages for the antiaircraft guns, some of them are under manufacture at the arsenal and some of them are under contract. Just where the particular ones will go I do not know now.

Mr. **Sherley**. The statement you made touching similar guns for the continental United States applies also as to these guns?

Gen. **Crozier**. Yes, sir.

Mr. **Sherley**. How many of these guns were there for the insular possessions?

Gen. Crozier. Seventeen.

Mr. Sherley. And the statement you have already made touching the 54 applies as to the 17?

Gen. Crozier. Yes; that is to say, applies to those of the 17 which have already been provided for by appropriation last year.

Mr. Sherley. Which was 10?

Gen. Crozier. Yes. Now I am asking in this estimate for funds for seven more; that is, in the regular estimate, not in the supplemental estimate. The supplemental estimate covers only the 12-inch carriages.

Mr. Sherley. At what price?

Gen. Crozier. $10,000, with an allowance of 25 per cent for increase in price. That is the price each. The total sum I am expecting to devote from the funds to be appropriated under this estimate to the antiaircraft guns is $88,000 for the insular possessions.

Mr. Sherley. $300,000 of the sum is to take care of your contract authorization of last year?

Gen. Crozier. Yes.

Mr. Sherley. That would leave $179,000.

Gen. Crozier. The two items we have just mentioned together make $388,000. Then, I expect to devote $150,000 to two 12-inch howitzers on railroad mounts, which are not included in the Board of Review's $96,000,000 project.

Mr. Sherley. To be used in the insular possessions?

Gen. Crozier. Yes; to be used in Hawaii. And then the other item is the $138,000 of the supplemental estimate which I mentioned a minute ago; and these three items, $388,000, $150,000, and $138,000, make up the $676,000 which is the total of the cash and contract authorization which I am asking for now, the contract authorization being $59,000.

Mr. Sherley. Why did you ask for such a small contract authorization, General?

Gen. Crozier. I think I could get along with a larger contract authorization than that to be taken from the cash, although there is not anything that is contemplated to be done here which ought necessarily to take a very long time. The probabilities are, Mr. Chairman, in looking over the sum total in the estimates, the cash and the authorization, it was found that at some points the cash asked for was something like $59,000 greater than some kind of limit which had been set; and in looking for a place where it could be taken from, it was taken from this as a place where we could certainly spare it. Now, we could probably spare more if necessary. There are two items there which will take some time to manufacture—the 12-inch howitzers on railroad mounts and the barbette carriages—but it ought to be possible to get both of those items within the 18 months which are likely to elapse before we get another appropriation.

Mr. Sherley. General, you say that this proposal for two 12-inch howitzers on railroad cars is in addition to the Board of Review's project. Have they been passed upon by the Board of Review?

Gen. Crozier. This kind of armament, if we may call it that, has been passed on by the Board of Review; yes. The Board of Review has expressed itself as considering this kind of thing as necessary. That conclusion was formulated after the $96,000,000 project was made up.

HAWAIIAN ISLANDS.

Mr. **Sherley.** General, in view of the six 12-inch guns which it is proposed to mount in the Hawaiian Islands, is there any special need for these two pieces?

Gen. **Crozier.** There is a railroad, Mr. Chairman, that runs around a good part of that island, and it affords an opportunity to place some pieces of this kind at any one of a number of points.

Mr. **Sherley.** How much of the total island does it encircle, do you know?

Gen. **Crozier.** It runs along the southern part and the western shore of the island and part way around on the north shore. I think it encircles a good deal of the island except the eastern shore. It does not encircle the eastern shore at all.

Col. **Winslow.** Mr. Chairman, I have been out there, and I would say that it encircles about two-thirds of the shore line, running close along the shore.

Mr. **Sherley.** The idea, then, is to use these 12-inch howitzers on this railroad?

Gen. **Crozier.** Yes, sir.

Mr. **Sherley.** They have all-around fire?

Gen. **Crozier.** Yes.

Mr. **Sherley.** And they are to be built similar to those you have described?

Gen. **Crozier.** No; what I am hoping for with these is to get a design from abroad which has been already proved out by experience, and on which I can go to work and build at once without constructing a pilot. I think that will work out.

Mr. **Sherley.** In the event we wanted to give you less cash and more authorization, what sum would you suggest?

Gen. **Crozier.** One of those 12-inch howitzers on railroad mounts, $75,000, and one of the barbette carriages, $69,000, making a total of $144,000.

Mr. **Sherley.** In addition to the $59,000?

Gen. **Crozier.** Yes. I do not mean to say, Mr. Chairman, that if we were to increase that contract authorization by $144,000 it would not delay the procurement of any of this material. I am inclined to think it would. In that case we would have to put one of those barbette carriage or one of the 12-inch mortars onto some other order and have it executed at the end of the other order, which might throw it beyond the time we could otherwise get it.

PURCHASE, MANUFACTURE, AND TEST OF AMMUNITION FOR SEACOAST CANNON, INSULAR POSSESSIONS.

Mr. **Sherley.** General, the next item is:

> For purchase, manufacture, and test of ammunition for seacoast cannon, including the necessary experiments in connection therewith, and the machinery necessary for its manufacture at the arsenals.

You are asking for $2,229,000 of appropriation and a contract authorization of $1,000,000. Last year you asked and obtained $1,700,000, with a contract authorization of $500,000.

This is for reserve ammunition for the seacoast defense of the insular possessions?

Gen. **Crozier.** Yes, sir.

Mr. **Sherley.** What percentage under the new project did you have prior to last year's appropriation, and to what extent in percentage did that increase it?

Gen. **Crozier.** It increased the percentage for the armament which has been already provided for 31 to 44½ per cent of the total allowance for the armament contemplated in the Board of Review's project; and so much of this armament has been already provided for that the percentage of ammunition provided for the armament already provided is nearly the same—45 per cent.

Mr. **Sherley.** General, the Board of Review's project for ammunition for the insular possessions, as I recall, is just about 100 per cent more than the old scheme. If I am right in that, somebody is wrong somewhere, because we had considerably more than double the percentage of ammunition that you indicate we had prior to this appropriation as against the old scheme; in other words, we were up in the nineties.

Gen. **Crozier.** This would make it up in the nineties.

Mr. **Sherley.** This would make it up in the nineties, with the addition of $1,500,000 of last year's appropriation; but prior to that we were practically well up in the nineties, as I recall.

Gen. **Weaver.** The new allowance is more than double the old allowance.

Mr. **Sherley.** It must have been for the mortars, then, because it just doubled it for the guns, as I recall.

Gen. **Crozier.** For the guns what was had before was a two hours' allowance for all the guns, and now we have the accuracy life of the guns. I do not remember that one of those was exactly double the other, although I can give you the figures right here.

Mr. **Sherley.** I notice from a table which has just been handed me that I was mistaken in my conclusion that the board's project was only about 100 per cent greater than that of the Taft Board.

Gen. **Crozier.** It is more nearly 200 per cent.

Mr. **Sherley.** Yes; and in money value it is nearly 200 per cent greater.

Gen. **Crozier.** The total value of the ammunition for the armament already provided for, and in addition that contemplated by the Board of Review's approved project, is $12,359,000; and as I say, we have already provided for 44½ per cent of that amount.

Mr. **Sherley.** To what extent will the appropriation which you are now asking increase the amounts?

Gen. **Crozier.** It will increase that 45 per cent to 63 per cent.

Mr. **Sherley.** Is this estimate on the basis of completing the supply in two more appropriations in addition to this one?

Gen. **Crozier.** Yes, sir. The estimate this year on that basis would be $2,274,000 for new ammunition; and then adding to that $500,000 to cover the authorization of last year and adding to it 20 per cent to cover the difference in price from that used in the original estimates, we would get $3,229,000, which is made up by the cash estimate and the contract authorization of the present item.

Mr. **Sherley.** I presume, General, the statement you made touching a similar item for continental United States applies as to this item?

Gen. **Crozier.** Yes, sir; those statements are general, because in procurement we treat the ammunition for the United States and the ammunition for the insular possessions together; and in connection with that, I might speak of something that was mentioned in the hearings when we were on the subject of ammunition for the continental United States, which related to the cost of powder. A comparison was suggested as to the cost of powder at the Army factory and at the Navy factory. The cost of powder last year at the Army factory was about 46.1 cents a pound; that is, for cannon powder, and the cost of powder at the Navy factory for the same year is reported by the Chief of the Bureau of Ordnance of the Navy at practically 44.1 cents a pound, a difference of 2 cents only, which was less than I think you supposed; and that 2 cents might be accounted for by the fact that the Navy powder factory makes at least a part of its nitric acid and a part of its sulphuric acid, whereas we buy all of ours.

BALANCES.

Mr. **Sherley.** General, I forgot to ask you as to your balances.

Gen. **Crozier.** On December 9 the Treasury balance was $1,658,324.92, and there was due under contract or orders $1,579,408.30, leaving an unallotted balance of $78,916.62. I can give you, in addition, a piece of information which you sometimes ask for and which I have with reference to this estimate, which is that of the $500,000 authorized to be obligated in addition to the appropriation there remains unobligated the sum of $108,000.

Mr. Chairman, it is apparent from the questions that you have asked me that you are desirous of ascertaining how much of the funds appropriated at the last session of Congress for material of the general classes covered by this bill will be expended in manufacture at ordnance establishments. Perhaps a consolidated statement might not be out of place here. This statement must necessarily include the appropriations in the sundry civil act for seacoast armament and ammunition for Panama and the appropriations in the Army act for mobile artillery and mobile-artillery ammunition.

	Amount appropriated for 1917, including contract authorizations.	Amount that will be expended at ordnance establishments.
Mobile artillery matériel, exclusive of ammunition	$16,321,500	$6,150,000
Mobile artillery ammunition, including that for target practice	20,180,000	6,000,000
Seacoast armament, exclusive of ammunition	5,124,000	2,976,000
Seacoast cannon ammunition, including that for target practice	10,790,000	3,500,000
Total	52,415,500	18,626,000

ALTERATION AND MAINTENANCE OF THE SEACOAST ARTILLERY, INSULAR POSSESSIONS.

Mr. **Sherley.** The next item is, "For alteration and maintenance of the Seacoast Artillery, including the purchase and manufacture of machinery, tools, and materials necessary for the work, and expenses of the civilian mechanics, and extra-duty pay of enlisted men engaged

Gen. Crozier. Yes, sir.

Mr. Sherley. What percentage under tl
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go down inside there.

GAUGES, DIES, ETC.

which you are interested is—

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thereon." Last year you asked for $79,000 and got $60,000. This year you are asking for $494,510.

Gen. **Crozier.** Yes, sir. There is one very large item which will account for more than half of that, and that is $280,000 for five 14-inch spare guns. These five guns which I am asking for will be all of the spare guns of heavy caliber which I am expecting to be required for the insular possessions. There is another large item, the next largest, of $36,000, which is for the alteration of six 14-inch disappearing gun carriages, all there are in the insular possessions, so as to give 20 degrees elevation to the guns. The next largest item is $28,575 for the general repair and maintenance of 127 guns and mortars, with their carriages and fire-control instruments, including the pay of mechanics and extra-duty pay of enlisted men engaged on that work. The next largest item is $19,523, for cleaning and preserving materials which are purchased out of this appropriation for the insular possessions, but are purchased out of the appropriation for the Army at large as far as the coast defenses of the United States are concerned. It is put in this appropriation for the insular possessions in order that these coast defenses may stand as an expense by themselves more particularly.

Mr. **Sherley.** That is perhaps logical as far as it goes, but there are a good many other things on the same basis which would take a special item in this bill, but which do not now.

Gen. **Crozier.** This does not mean that with this arrangement the division of expense for the defense of the Philippine Islands or the maintenance of the military establishment in the Philippine Islands is clearly differentiated from that in the United States, because it is not.

Mr. **Sherley.** Has this been the usual practice?

Gen. **Crozier.** Yes; this has been the usual practice. The next largest item is $10,000 for spare parts for the guns, and the next largest is $10,000 for two new ordnance-repair shops and equipment of them, one at Fort Frank, on Caballao Island, and the other at Fort Drum, on El Fraile Island. Each one of those items should be increased by 25 per cent, in order to account for the difference in present costs and the costs when those estimates were made up, which were the old costs. There are one or two little items that I have not put in—at least, I have not detailed them; but what I have given you pretty nearly makes up the whole sum. I think I might say here, what I do not think I have said before, and that is that the reason I continue this practice of giving certain prices that have been used before and then increasing them by percentages in order to arrive at the present costs, instead of just taking the new costs, is twofold. First, so that we can compare the estimates of cost heretofore made, and, second, if we are fortunate enough in the future to have the prices dropped to the ones which were used when the projects were commenced we can drop this 25 per cent off and continue to use the same figures that were given in the first place.

Mr. **Sherley.** It is very necessary that you keep your bookkeeping straight as to the value of the reserve on hand and to keep in front of you an accurate idea as to how much money is needed to complete any particular project?

Gen. **Crozier.** Yes; and we are all the time having to make comparisons, you know.

Mr. **Sherley.** These five spare guns are in accordanace with the policy that you outlined a while ago?

Gen. **Crozier.** Yes.

Mr. **Sherley.** Can you reline guns in either the Hawaiian Islands or in the Philippines?

Gen. **Crozier.** No, sir; we can not. It might be possible to reline a very small one there but we could not reline a large gun.

Mr. **Sherley.** It is necessary to send the guns across the ocean and across the continent in order to do that work?

Gen. **Crozier.** Yes. If you should not do that it would be necessary to install big lathes out there, which can bore and turn these large guns.

Mr. **Sherley.** Of course, it ought to be some time before you need to do any relining in regard to these guns, which are pretty new?

Gen. **Crozier.** Yes; and the time would be longer than some of the information which I have given you would indicate, because the target practice with these guns is not held with the full charge. Using these 14-inch guns with 2,250 velocity we are 100 feet under the service velocity, and that will make a difference in the life of a gun.

Mr. **Sherley.** Has the increase in the powder chamber of all of these 14-inch guns been completed?

Gen. **Crozier.** I think that work has all been completed at Panama and elsewhere.

Mr. **Sherley.** The alteration of these six guns, in order to give them a 20-degree elevation, is in line with what you have said touching similar work in continental United States?

Gen. **Crozier.** Yes, sir.

Mr. **Sherley.** That will not affect the depression range that the guns now have?

Gen. **Crozier.** The same thing is true as to them as is true of the guns in continental United States, the carriages having been built from the same drawings.

Mr. **Sherley.** You have an item for $10,000 for two repair shops. How many repair shops have you there now?

Gen. **Crozier.** There is one at Fort Mills, which is on Corregidor Island; and one at Fort Wint, which is on Grande Island, in Subig Bay, and these two will go, one on Caballao Island and the other on El Fraile Island.

Mr. **Sherley.** Have you room enough on El Fraile Island for a repair shop?

Gen. **Crozier.** We will have to go down inside there.

PROCUREMENT OF GAUGES, DIES, ETC.

Mr. **Sherley.** The next item in which you are interested is—

> For the procurement of such gauges, dies, jigs, tools, fixtures, and other special aids and appliances, including such plans, specifications, and detail drawings as may be necessary for the immediate manufacture of arms, ammunition, and other material necessary for the defense of the country, and for loans for and the installation of such material in private plants in the United States under such contract and agreement as may be made by the Secretary of War.

The appropriation of $1,000,000 was initiated by this committee for this purpose. There were two limitations on it; one, "that not exceeding 25 per centum of said sum may be used in obtaining from plants so equipped such war material as may be desired," and a further limitation "that not exceeding $50,000 worth of such material may be purchased from any one person or company, and in making such expenditures the laws prescribing competition in the procurement of supplies by purchase shall not govern." What have you been able to do along this line?

Gen. CROZIER. None of that money has yet been obligated. We have given a great deal of consideration to the subject and have reached the conclusion that the action contemplated by that appropriation should be carried out with reference to ammunition only; that that would be the best application of the funds.

Mr. SHERLEY. There is carried in the Army act three authorizations, one amounting to $250,000 in the appropriation for small-arms ammunition, one of $200,000 in the appropriation for manufacturing, repairing, etc., arms, and one of $200,000 in the appropriation for field-artillery ammunition for the National Guard, making a total of $650,000 in addition to this $1,000,000.

Gen. CROZIER. Yes. I thought that it would not be necessary to use the authorization as far as small-arms ammunition is concerned at all, for the reason that manufacturers of small-arms ammunition in the United States either are or can easily be induced to have themselves equipped with the necessary means for supplying our ammunition, and we are able, with our current appropriation for small-arms ammunition, to distribute the orders in such a way as to make it worth while for several of these ammunition manufacturers to keep themselves so supplied without using the special appropriation. That is probably not the case with reference to the artillery ammunition or with reference to the small arms.

Not only that, but it is quite to be expected that such manufacturers as would be successful bidders in the usual way for artillery ammunition, and particularly field-artillery ammunition, for which these provisions are most usefully applied, and for small arms, would be situated in parts of the country where we would not care to expend Government funds in especially encouraging the equipment of plants for doing our work; in other words, they would be in parts of the country that would be too exposed. Therefore we have concluded that these sums would best be expended with reference to field-artillery ammunition and to small arms, and we would expect to make some kind of a discriminating choice as to the establishments where we would bestow this assistance. Now, there is another consideration: Our appropriations are such that we have considerable sums of money which must be expended in the procurement of small arms—rifles particularly—and of field-artillery ammunition from private manufacturers, which procurements can be made only after advertisement and competitive bidding. If we were to select our establishments beforehand upon which to bestow the aid which is intended to be bestowed pursuant to this legislation and then advertise we would give those establishments right in the beginning a very considerable advantage over other establishments in the competitive bidding, and we have not felt that that was the best thing to do.

Therefore we have put off utilizing the authorization in these appropriations until after we shall have placed all the orders which we are contemplating placing in the usual way. Now, a number of the appropriation acts were passed quite late in the year—in fact, the controlling appropriation act with reference to this subject, namely, the Army appropriation act, was passed late in August—and in consequence of the policy which I am just outlining we would not be in a position to utilize any portion of the $1,000,000 appropriated in the fortification act for this purpose until after we had placed our contracts for field-artillery ammunition to be procured from funds appropriated in the Army act. Since the Army bill only became a law about three months ago, and since the appropriations made in it and in the fortification bill were quite large, it has occupied my office until practically the present time in placing our orders for manufacture; in fact, we are just now getting out the advertisements for bids for the supplying of rifles, and we have just now given orders to the Frankford Arsenal to get out its advertisements for the purchase of the field-artillery ammunition which must be purchased, and it will not be until those advertisements are responded to and contracts are placed in accordance with the proposals that we will be prepared to expend any of the money for this special purpose.

Mr. **Sherley.** You ask, however, for a half million dollars additional?

Gen. **Crozier.** That is a pretty modest sum, and inasmuch as we will not have an opportunity to ask for any more until the appropriation bill will be under consideration in the next Congress, I ask for this amount with the expectation that the policy provided for will prove successful.

Mr. **Sherley.** Inasmuch as you have not expended any of this fund, you are not in a position to speak from experience, at least, touching either of the limitations that are placed upon the expenditure.

Gen. **Crozier.** No, sir.

NATIONAL COUNCIL OF DEFENSE.

Mr. **Sherley.** General, there has been created what is known as the National Board of Defense, I believe, or National Council of Defense, composed of various officials of the Government and various private citizens, whose general purpose it is to devise ways and means for the mobilization of the resources of the country in the interest of its defense, and to consider generally the broad basic matters pertaining to national defense. Have you taken up with that board or council, in any way, the question of how best to expend the moneys herein made available?

Gen. **Crozier.** No, sir; I have not; but I am contemplating doing so along the following lines: As I indicated a few minutes ago in my testimony, the location of the establishments which it would be wise for the Government to aid, with reference to their defensibility, is important, and therefore some pronounced views in regard to such locations are desirable. In consequence of this, I have written a letter intended to find its way to the War College Division of the General Staff, asking that question concerning the location of small-arms factories, mentioning a number of them and giving their location, and asking whether any of those ought to be excluded, on account of their location with reference to their attackability, from consideration in the selection of the establishments and their equipment with special fixtures, etc. I received a reply from the War College Division. Now, after having placed the orders, following the advertisement of which I spoke a moment ago, I am expecting to ask the Advisory Committee of this National Council of Defense for advice, concerning establishments properly located, as to which one, in case we could only equip one, would be best qualified to be of aid to the Government in time of emergency, and to assist in making the selection which is allowed by express provision of law, of the establishment to be equipped in this way, or of the different establishments when the appropriation is sufficient to equip more than one, as is the case with the appropriation of $1,000,000 which you mentioned.

BOARD OF ORDNANCE AND FORTIFICATIONS.

Mr. SHERLEY. The next item is for the Board of Ordnance and Fortifications. Last year we gave you $300,000, which was a very large sum in comparison with what you had had theretofore in recent years. It was given you in the belief that there was considerable work in the immediate future ahead of that board in the way of experiments and tests. What have you done with that money, and, briefly, what have been the activities of that board for the past year?

Gen. CROZIER. The date of the act appropriating that $300,000 was July 6, and, adding that appropriation to the balance on hand, the board had then $302,181.23 subject to allotment. Between July 1 and the first of this month allotments have been made aggregating $71,120 for experiments, and $4,300 for the expenses of the board until June 30, next. I should have mentioned that the expenses of the board for the first half of the year, until December 1, were $3,000, leaving $68,120.53 for experimental purposes instead of the $71,120 that I have just mentioned. Of these experiments, the most considerable is one for which an allotment of $62,000 was made; and that is for the construction and test of types of parapet for seacoast fortifications. The next allotment was for a railroad car for mounting a 7-inch howitzer, which allotment was $4,500. The balance available now for general experimental work is $226,760.70. There is ahead, as I said at the time the last appropriation was made, the possibility, or rather probability, of considerable sums being asked from the board for experimental purposes.

For instance, I have mentioned several times our desire to get some designs from abroad and at some time to construct from them material for supply to the service. If that should not be possible, because of the amount of funds required, it will be desirable in such case to make at least an experimental construction from those designs. I have referred particularly to the heavy artillery mounted sometimes on railroad cars. That has been wanted usually in accordance with the demands that have come from the board of review, or from other parts of the War Department, for seacoast purposes, and, in so far as anything of that sort must be held to relate to seacoast purposes, I have no funds available out of the ordnance appropriations which are applicable. In fact, I have had to make certain supplemental estimates, as indicated in these hearings, so that I think it is quite probable that I shall make one or two requests myself for the experimental construction of seacoast material of this class. The report of the board for the year 1916 has appeared and has been sent to the committee. That report gives a statement of the allotments made during the entire fiscal year, and I have just supplemented that by giving a statement of the allotments made since the end of the fiscal year.

Mr. SHERLEY. You are asking this year for $150,000, and that, it is believed, with the balance that you have and will have on hand, will be sufficient until another appropriation becomes available.

Gen. CROZIER. I think it will be sufficient until another appropriation shall become available.

Mr. SHERLEY. General, is there anything else you have to submit?

RENTAL OF SUITABLE SPACE FOR DRAFTSMEN.

Gen. CROZIER. Yes, sir; there are one or two other items in the bill, Mr. Chairman. I think there has been sent to you a letter modifying a provision which was proposed with reference to the bill to the effect that $10,000 of the fund appropriated by the act might be expended for the rental of suitable space for draftsmen in Washington. The modification increases the sum thus authorized to be expended from $10,000 to $25,000, because we have found already by experience that we need to employ more draftsmen than can be accommodated in $10,000 worth of space. The provision has also been modified so as to carry authority to enter into a lease for a period of not exceeding six years, which would permit us to count on future appropriations, as it is difficult to get a proprietor to make alterations necessary to suit their buildings to our purposes unless they have some guaranty of a longer period of rental than one year.

Mr. SHERLEY. Have you in mind any particular building?

Gen. CROZIER. We would like to have about 20,000 feet of floor space as near the War Department as we can get it; and at a cost of $1.25 a square foot it would amount to $25,000. This $1.25 per square foot would be expected to include the maintenance of the building as well as the rent, and we would expect the rent proper to be something like three-fifths of the total; and the maintenance, which would include heat, light, and removal of refuse, messengers, watchmen, etc., would cover the rest. We need the authorization for both kinds of expenditures, because we are permitted neither to rent space nor to employ labor out of lump-sum appropriations, unless we have special authorization. With the $10,000 we were authorized to expend by the last fortifications act we have rented a building for $6,300 a year, and the expenses for maintenance, including messengers, laborers, and watchmen, run the total up to $10,104 per annum. The fact we did not get this building until after the commencement of the year is one reason why the excess of the sum which I have just indicated for yearly rental and maintenance over the $10,000 authorized to be expended does not matter. The space which we have been able to rent with the funds which we have been authorized to expend will not accommodate more than about 100 draftsmen, and in addition does not give us quite enough space for accessory objects, such as the filing of drawings and other papers in connection with the drafting work and the making of prints, which is necessary to a very large extent in the reproduction of the drawings for different kinds of use.

Mr. SHERLEY. Is there anything else, General?

Gen. CROZIER. Yes. There was added to the bill on its way through Congress at the last session a provision that none of the funds appropriated in the bill should be expended in connection with the making of what are called time studies or for the payment of premiums to workmen. I consider that an unfortunate provision of the law, and I have a little evidence here as to the effect of it. You will understand, Mr. Chairman, that the time study which is spoken of is a means for scientifically ascertaining the length of time that a job of work ought to take. The method may not always be scientifically carried out, because a time study, like any other process, can be badly made or well made, but it is an attempt to ascertain in the most accurate way possible the reasonable time for doing a job of work. The legislation, you will notice, does not forbid the timing of a job of work—that is to say, under the legislation it is still possible to take the time of the commencement of a job and the time of the ending of the job—but the legislation prohibits the making with a stop watch or other time-measuring device a time study of any job of any employee "between the starting and completion thereof." That is to say, it prohibits the dividing up of the job into its component parts and timing these separately, which is the most scientific way of ascertaining how long a job of work ought to take. So that the scientific and accurate part of this process is the part which is forbidden by law.

It is, therefore, difficult to ascertain the data necessary for proper rate setting. By rate setting I mean the fixing of sums of money which shall be paid for jobs of work. However, we have on hand in some of our establishments so much information already upon this point that we can still set rates reasonably well and would, as far as this part of the legislation is concerned, be able still to pay premiums for output, but we are forbidden by the legislation to which I refer also to pay premiums; that is to say, we can not make a payment for output in the form of what is called a premium. Now, here has been something of the effect of that legislation at the arsenal where we were paying premiums. I have here a report of 49 different jobs of work which were done under the premium-payment system and which were also done by, in each case, the same man without the payment of premiums; that is to say, after the payment of premiums had been prohibited. No effort has been made to select cases showing specially bad comparisons, but the jobs have been taken just as they came. I think that these jobs are, therefore, fairly indicative of the effect of the prohibition of these premiums. The first one is a case in which a workman had the job of recapping the bases of some 4.7-inch shells. Under the premium system he did 100 of these in 10 hours. The next day he was given another 100 to do. In the meantime the premium had been prohibited and he then took

22.95 hours to do the 100. This man had, during the six months preceding the 30th of last June, when he had been working on premium jobs, earned on an average 35 per cent over and above his regular pay. It will be seen from the figures that I have just given that when the premiums were taken away he immediately took 2.3 times as long to do the same work as he had taken before.

Now, the cases here, of which I have 49, are not all as bad as that, but some of them are worse. Here is the case of a man who had in May, while the premium system was still in force, the job of slotting the base plugs of 4.7-inch projectiles. He did each one of them in an average of 2.6 minutes; in September he had another job of doing the same thing. The premiums had then ceased and he took 11 minutes to do each one, which is over four times the time which he had taken before, when working under the premium system. This is not the worst case, although it is one of the worst of the 49. The average time taken on jobs which were done in the machine shop was 2.2 times as long as it had taken to do the same jobs under the premium system. In the foundry this average was 1.6 times as long. In the smith shop it was 2.1 times as long, and with the yard gang of laborers it was 1.8 times as long. I am speaking now of the averages on these 49 jobs which have been reported on. I give that evidence, Mr. Chairman, simply as an indication of what can be expected in regard to the cost of this kind of work that is appropriated for in this bill under that legislation. I can add that reports from the Watertown Arsenal are to the effect that the spirit of cheerfulness, industry, attention, and satisfaction is not nearly as apparent as it was before the premiums were stopped.

WASHINGTON, D. C., *Friday*, *December 15*, *1916*.

STATEMENT OF MAJ. GEN. ERASMUS M. WEAVER, CHIEF OF COAST ARTILLERY, ACCOMPANIED BY MAJ. STANLEY D. EMBICK.

MAINTENANCE OF COAST ARTILLERY WAR-INSTRUCTION MATERIAL AT COAST ARTILLERY POSTS.

Mr. **SHERLEY**. General, the first item in which you are directly interested is found on page 13, "For maintenance of Coast Artillery war instruction matériel at Coast Artillery posts, including necessary material and labor therefor, and for extra-duty pay to soldiers necessarily employed for periods of not less than 10 days." You are asking $750 and last year you received $1,250.

Gen. **WEAVER**. This year we are asking for less.

Mr. **SHERLEY**. What was done with the money last year?

Gen. **WEAVER**. The items are as follows: Purchase of 170 copies of Jane's "All the World's Fighting Ships"——

Mr. **SHERLEY** (interposing). How much did they cost?

Gen. **WEAVER**. $500. Purchase of material for the manufacture of lantern slides, $75; purchase of stationery; that is, ships' targets, ammunition blanks, and orders, $52; purchase of bulbs for 457 miniature searchlights, $45.50; purchase of carbons for 43 balopticons, $44: purchase of the necessary paints, oils, hardware, and material for the repair of 45 Coast Artillery war instruction installations, $133; extra-duty pay to soldiers necessarily employed for periods not less than 10 days in making ships' models and relief maps, $100.

Mr. SHERLEY. Have you expended all that sum?

UNEXPENDED BALANCE.

Gen. WEAVER. That money is in course of being expended. The Treasury balance on December 1 was $914.14.

Mr. SHERLEY. How much of it is allotted and how much free?

Maj. EMBICK. That allotted has been expended or obligated.

Mr. SHERLEY. So that you really have a free balance of $914?

Maj. EMBICK. Free for the ensuing year.

Mr. SHERLEY. For the remainder of this year?

Maj. EMBICK. Yes.

Mr. SHERLEY. How much of it are you going to need this year?

Gen. WEAVER. Presumably we will need all of it. Of this $914, $500 of it will be expended for 170 copies of Jane's "All the World's Fighting Ships."

Mr. SHERLEY. That will leave them about $400?

Gen. WEAVER. Yes, sir.

Mr. SHERLEY. General, what sort of results are you getting from this work?

Gen. WEAVER. We are getting excellent results. It has fully realized our expectations. During the winter period particularly it enables the officers, and especially the higher officers, to have exercise in a practical way in coast-defense problems; in estimating situations that are presented in such problems, and in carrying them out so far as the issuing of orders is concerned; recognizing the maneuvers of the enemy in attack, and issuing instructions to meet such maneuvers. Prior to the introduction of this game there was a serious deficiency in our instruction, which is now met in a satisfactory manner. We have this equipment installed now at all coast defenses, and inspectors, in the course of their inspections, call upon officers to demonstrate their capacity in exercising coast-artillery command by solving correctly war-game problems.

COAST ARTILLERY TARGET PRACTICE.

Mr. SHERLEY. General, on page 48 there is an item relating to seacoast artillery practice. The amount asked for and the purpose intended has been explained as heretofore by Gen. Crozier, chief of ordnance; but I think the committee would like to hear something touching the results that have been obtained from the expenditure of this money in the immediate past; and if you have any statement to make touching the character of shooting which the seacoast artillery are doing, we will be glad to have it.

Gen. WEAVER. Our practice during the last year and up to the present time this year has been most satisfactory. The practice has taken place at longer ranges than has been tried heretofore and more shots have been fired at long ranges and the percentage of hits has been greater. On page 11 of my annual report for 1916 I give a tabulation of the shots that have been fired up to January 1 last, and it will be noted that at the longer ranges—that is, between

10,000 yards and 11,000 yards—the percentage of hits of the 12-inch rifle, which may be spoken of as our main caliber at the present time, was about 30 per cent, and at the same ranges for the mortars about 11 per cent. That maintains the ratio which we expect to get between the mortars and the guns almost exactly—three times the accuracy at different ranges from the guns that we get from the mortars.

Mr. **Sherley.** In figuring your mortar practice, does that mean individual mortars?

Gen. **Weaver.** Yes, sir; that means individual mortars.

Mr. **Sherley.** Have you ever figured it out on the basis of the volley firing of mortars?

Gen. **Weaver.** Yes; it has been figured out on the basis of four mortars to the pit firing, and also on the basis of two mortars to the pit. If a salvo from two mortars be considered as the unit, the percentage would be twice that of the single gun.

Mr. **Sherley.** General, while your showing is reasonably good up to 11,000 yards, it falls off between 11,000 yards and 12,000 yards, being for 12-inch rifles 24 per cent and for the 12-inch mortars 10 per cent.

Gen. **Weaver.** It falls off 1 per cent.

Mr. **Sherley.** Yes; when you get to the range of from 12,000 to 13,000 yards it disappears entirely.

Gen. **Weaver.** As a matter of fact, you will notice there were only seven shots fired.

Mr. **Sherley.** And they all missed.

Gen. **Weaver.** That is true; but that is not a fair criterion to judge the firing by. Our firing heretofore has been at ranges even less than 11,000 yards, and that range was considered the extreme range a couple of years ago.

Mr. **Sherley.** I notice also with the 12-inch guns when you fired at very short ranges you did not get any hits; firing at ranges between four and five thousand yards there were five shots fired and no hits.

Gen. **Weaver.** I am very glad to have you call attention to that, because there was something abnormal in that condition there, and you will notice there were only five shots fired. It is just as improper to take as a criterion a small number of shots fired at four or five thousand yards as it is at seven or eight thousand yards. On the other hand, you will notice that between five and six thousand yards, where there were 14 shots, the percentage of hits was 79 per cent. There were exceptional conditions there which affected it; probably that was only one battery fire.

Mr. **Sherley.** I notice also that the 14-inch rifle shooting at 11,000 yards fired 7 shots and got no hits.

Gen. **Weaver.** Yes; that is a fact; but too much should not be assumed from the fact that no hits were recorded, because the distribution of the fire may have been very good indeed. The bunching of the shots may have been very good, and they may have simply been unfortunate. There was only one battery firing.

Mr. **Sherley.** But this is all we have got to judge by, General.

Gen. **Weaver.** Yes; but I say that seven shots is not a fair criterion to judge practice by, and, as a matter of fact, I do not think it ought to be listed.

Mr. SHERLEY. General, you spoke of this being at long ranges. They are long ranges compared with what used to be the rule, but they are not at all long ranges in view of the long-range firing which has taken place between battleships within the past year.

Gen. WEAVER. They are not long ranges in the modern understanding of the term, but they are long ranges for the guns and mounts of our type.

Mr. SHERLEY. No, General; the 14-inch gun can not be said to be shooting at a long range at 11,000 yards.

Gen. WEAVER. I had in mind the 12-inch gun.

Mr. SHERLEY. It has a range of 19,000 yards.

Gen. WEAVER. At 15° elevation.

Mr. SHERLEY. And will have a range of over 22,000 yards at 20° elevation.

Gen. WEAVER. The 14-inch gun has just come into our hands, and they are only mounted at a very few places. You will notice above there that at from 8,000 to 9,000 yards there was 43 per cent with the 14-inch gun, which compares favorably with the 12-inch gun, which is 38 per cent; 43 per cent is about what you would expect at that range, or probably 50 per cent.

Mr. SHERLEY. That is pretty nearly a flat trajectory with a 14-inch gun at that distance.

Gen. WEAVER. We only have 2,150 foot-seconds muzzle velocity, and we do not shoot with the full charge.

Mr. EAGAN. General, why should there be so great a difference between the firing at from 8,000 to 9,000 yards and from 10,000 to 11,000 yards with the same number of shots and the same number of guns?

Gen. WEAVER. If you take the firing at from 8,000 to 9,000 yards at 43 per cent, the curve of hits would not have any such abrupt change in it as to have a complete miss at 11,000 yards if you plot it to range and hits.

Mr. SHERLEY. And yet that is exactly what happened with the same number of shots.

Gen. WEAVER. Yes; but it does not indicate a law.

Mr. SHERLEY. General, what have you to say about 1916?

Gen. WEAVER. Considering the reports of the record practices received to date for the 12-inch mortars, at five to six thousand yards, 12 shots fired and 33 per cent of hits; at six to seven thousand yards, 24 shots fired with 25 per cent of hits; at seven to eight thousand yards, 96 shots fired with 9 per cent of hits; at nine to ten thousand yards, 48 shots fired with 23 per cent of hits; at ten to eleven thousand yards, 24 shots fired with 17 per cent of hits; at eleven to twelve thousand yards, 52 shots fired with 21 per cent of hits; at twelve to thirteen thousand yards, 24 shots fired with 25 per cent of hits; and at thirteen to fourteen thousand yards, 12 shots fired with 8 per cent of hits.

Mr. SHERLEY. General, that seems to show for the mortars in the past year considerable improvement, particularly at the long ranges; but I notice in one instance there is a very marked falling off, a showing of 4 per cent as against ranges immediately shorter and longer of considerably more than that. I presume that was due to the fact that some particular battery showed up bad.

Gen. WEAVER. That is usually the case, that some particular battery, or maybe two batteries, that happen to fire at that range wi have misses, and that pulls down the percentage for the entire service. We analyze all the target-practice records and ascertain what is the cause of that, and if it were of sufficient importance we could go back and give you the exact batteries that were responsible for it. There is a board which meets and makes a very careful analysis of the firing afterwards and fixes the responsibility for poor firing, and that report is reviewed in our office. If there is any dereliction in the matter, the officer is called to account for it.

Mr. **Sherley.** Can you give us a statement of the showing as to the 12 and 14 inch rifles?

Gen. **Weaver.** Yes, sir. I would like to say in reference to the 12-inch mortars that a summation of it shows that out of 292 shots fired at all ranges from 5,000 to 14,000 yards there were 18 per cent of hits.

Mr. **Sherley.** Do you consider that a good showing?

Gen. **Weaver.** I think that is satisfactory, especially in view of the fact that at the long ranges the percentages were higher than at the shorter ranges.

Mr. **Sherley.** Evidently in shooting at extremely short ranges—that is, short ranges for mortars—there is greater difficulty than in shooting at long ranges?

Gen. **Weaver.** That is well understood.

Mr. **Sherley.** Because, as you get close to the protected zone, or, rather, the zone outside of the fire of the mortars——

Gen. **Weaver** (interposing). Yes, sir; as you come in. The best condition for firing mortars is at 45 degrees elevation, and if you have to elevate it above that, say to 60 degrees, the flight of the projectile is not as true. The variations are greater, and that is associated, also, with greater charges of powder. It is well understood that mortar firing gives its best effect at 45 degrees elevation with heavier charges. That is well illustrated in this firing here.

Mr. **Sherley.** Well, 45 degrees represents its maximum range.

Gen. **Weaver.** Yes, sir; its maximum range for a given charge of powder.. This statement shows that with the 14-inch rifle 7 rounds were fired from 11,000 to 12,000 yards with no hits. With the 12-inch rifles there were 7 rounds fired at ranges between 8,000 and 9,000 yards with 43 per cent of hits; at ranges between 9,000 yards and 10,000 yards 7 rounds were fired with 14 per cent of hits; at ranges between 10,000 and 11,000 yards 35 rounds were fired with 20 per cent of hits; at ranges from 11,000 to 12.000 yards 42 rounds were fired with 36 per cent of hits; making a total of 91 rounds at ranges from 8,000 to 12,000 yards with 29 per cent of hits.

We have made a selection here of some of the best records we have. The Thirteenth Company of Coast Artillery, with mortars, fired 12 shots at 12,070 yards average range and made 3½ hits in 6 minutes and 1 second.

Mr. **Sherley.** What is a half a hit?

Gen. **Weaver.** That is when they hit the bow or the extreme stern. This [indicating] is the target, and if it hits between here [indicating] and here [indicating] it is a full hit, but if it hits here or there [indicating] it is a half hit.

The Twentieth and Twenty-second Companies, at Fort Pickens, with 12-inch mortars, fired 24 shots with 6 hits in 21 minutes and 46 seconds.

Mr. SHERLEY. And I presume that the topography serves to complicate those factors also?

Gen. WEAVER. Do you mean in range finding?

Mr. SHERLEY. I mean that there are some places where the situation of a battery and the target that is to be shot at makes more difficult the accurate finding of the range, and, therefore, makes it more difficult to have accurate shooting.

Gen. WEAVER. Yes, sir; I think that is true; but, at the same time, it should be kept in mind that we are firing, so far as range is concerned, under conditions where no one at the gun has any particular responsibility as to the range.

Mr. SHERLEY. No; but his score is dependent upon how accurately it is worked out.

Gen. WEAVER. That is all done away from the gun, and those at the gun have nothing to do with the determination of the range. It is accomplished by plotting on a board the exact position of the target as it moves every 30 seconds, and then predicting where it will be 30 seconds ahead. As soon as that prediction is made it is corrected for the effect of variations in the atmosphere. Our ballistic tables are worked out for a certain stage of the atmosphere, say, for example, for a quiet atmosphere with 60 per cent of saturation of water. Now, then, if it departs from that, if there is wind moving, there is a component down the range and one across the range, and allowances have to be made for that, and if it has moisture, we have to make corrections for the density of the air.

Those corrections are plotted as they relate to the predicted point, and then that is called the corrected range; it is not the actual range of the target but it is the range, greater or less, depending on what factors of correction have to be applied. That corrected range is telephoned down and the men accept it; it is posted there so that before the gun is loaded and ready to fire they have indicated to them, 10 or 15 seconds before the time for firing comes, what the range of that point is, the corrected range, and the men at the guns then have nothing to do except to put a pointer on the range scale and get ready. There is only one man looking at the target at all, and his duties involve simply following the target horizontally; he is not charged with any responsibility as to range, so that when the range pointer is adjusted for the range the gun is ready to fire immediately. Of course, it is a disappearing gun, and as soon as it rises above the parapet it is ready to fire, and a gunner is considered rather derelict if he allows that gun to remain above the parapet longer than 5 seconds. So that is the only period that the gun itself is exposed. Although the target is moving we do not fire at a moving target; we fire at this point ahead, which is a fixed point. I would like to make the statement that this later data is only for a part of the current year—that is, for those reports received up to date.

FORT MORGAN TEST.

Mr. SHERLEY. Last year we had an interesting test known as the Fort Morgan test, actual firing by battleships at an emplacement that was built to correspond, practically, to emplacements actually built in our modern fortifications. As a result of the studies made as the Navy does, and giving cash prizes, but many of the Coast Artillery officers with whom I have talked about it felt that it would not be to the best interest of the service, and, while I never changed my own personal views about it, they have been associated with the troops more recently than I, and I gave way to their views in the matter.

Mr. **Eagan**. What are the chief elements that you take into account in this matter—the human element or the mechanical element?

Gen. **Weaver**. Well, of course, there are two things in target practice that you have got to keep distinctly in mind. There is the composition of the powder, which is the motive force, and that is beyond our control. We can not do anything with the chemical composition of it after the powder is given to us. We must accept it as it is. Then, there is another class of factors that enters, which may in a measure be modified, and that includes all that one can do in establishing identical conditions of loading each time. Therefore, when this powder is given to us we take that powder and blend it so that any variation that may be in this sack or in another sack may be distributed throughout the mass of the powder that is put in the guns. We then weigh the charge of powder very carefully, and we distribute the weights evenly or uniformly among the different bags which go to make up the whole charge. Then, in loading we handle them with great care, the whole idea being that each time a charge of powder is inserted in the bore of a gun it shall be as nearly identical as it can be made with that which preceded it in all others. Latterly we have made quite an important step in this particular field by changing the form of the powder charge from a number of bags to a single bag. Heretofore when the weight of the powder exceeded a certain amount and it was difficult for a man to handle it, we have divided up the charge and made another bag, so that it would be easily handled by one man. But we realized that in that there was a chance for inaccuracies to creep in, and now we have all of the powder made up in a single charge.

For the 16-inch guns, that is about 9 feet long, and it weighs something like 800 pounds. For the 12-inch guns, it is about 7 feet long. That change alone has reduced the maximum variation of our muzzle velocity for a group of charges from something like 50 foot-seconds to just one-half of that, or down to about 25 foot-seconds. That will be evident in our next practice undoubtedly. This remarkable target practice at Fort Hancock, where out of 7 shots at 11,124 yards ranges, 6 hits were made in 4 minutes and 21 seconds was due to that care, and my understanding is that the only shot that missed the target went about 43 yards short of the target. That is as near perfect firing as it is possible to get. Now, this pyramidal target is one 12 feet square, and that was hit twice in that firing at this range. The point I was trying to make clear was that it is from the extreme care exercised in handling the ammunition before it is put into the gun and fired that we get the best results.

Mr. **Sherley**. One of the big elements, however, that enters into the accuracy of fire and which would, of course, affect the showing made by the different batteries, is the condition of the weather and the atmosphere?

Gen. **Weaver**. Yes, sir; that is one of them.

Gen. WEAVER. No; it has not been made, due chiefly to the fact that a number of collateral questions have come up, as, for example, the question of the direction of a torpedo from an aeroplane. It was thought desirable that we should go into these new fields and exploit them carefully and pass upon them in making the final test. The board to conduct the test has been organized, and the preparations for the test are under its direction.

Mr. SHERLEY. Who constitute the personnel of that board?

Gen. WEAVER. The commanding general of the Eastern Department, Gen. Leonard Wood; Col. Squier, of the Signal Corps; and Capt. Gardner, of the Coast Artillery, are the Army members. The naval officers are Capt. Hoogewerff, Commander Todd, and Lieut. Ogan.

Mr. SHERLEY. Do you know, General, how soon it is expected that this test will be had?

Gen. WEAVER. My understanding is that the test will be made in the early spring.

AEROPLANES.

Mr. SHERLEY. I was informed the other night, by Maj. Squier, that Mr. Hammond had been furnished with an aeroplane and with an aviator in order to enable him to prepare for this test, but he was not then advised as to the exact date that it would be had.

Gen. WEAVER. A personnel has been furnished Mr. Hammond consisting of two officers, one a coast artillery and the other a signal officer, and a number of rated coast artillery men to assist in handling the searchlights, the power plants, and the plotting boards.

Mr. SHERLEY. It has developed in the hearing, or in informal talks, that it is expected the Coast Artillery will use aeroplanes in the future in connection with fire control, and that particularly at night, by the use of these aeroplanes and the dropping of flares, much better results in the location of the enemy might be had. I notice that no estimates are submitted for the purpose of acquiring such aeroplanes. Has any determination been reached as to what, if any, need the Coast Artillery will have for aeroplanes?

Gen. WEAVER. We have discussed in the department the undoubted need of aeroplanes in connection with our fire-control work—that is, for directing the firing, and also in connection with the use of flares, as you have indicated. No estimates for hydroplanes were included in the fire-control estimates of the chief of the Coast Artillery, because of the fact that the Signal Corps had included amounts in their general aviation estimates which would include hydroplanes for the Coast Artillery.

Mr. SHERLEY. I presume you refer to estimates submitted in the Army appropriation bill?

Gen. WEAVER. My understanding is that they are in the Army appropriation bill.

Mr. SHERLEY. The reason I inquire especially about it is because it is proper to state that this committee unquestionably has jurisdiction of all appropriations looking to the furnishing of aeroplanes for use in connection with seacoast fortifications, and it may be of interest to state that this committee for many years received estimates and exercised jurisdiction over estimates touching aeronautics generally.

SUBMARINE MINE MATERIAL, UNITED STATES.

Mr. **Sherley.** General, the next item is:

> For purchase, manufacture, and test of submarine mine matériel, and other accessories for submarine mine practice, including the machinery necessary for their manufacture at the arsenals.

You are asking for $26,000, the amount which you had last year?

Gen. **Weaver.** Yes.

Mr. **Sherley.** What is the condition of your balances?

Maj. **Embrick.** The Treasury balance December 11 was $42,000; unobligated balance, same date, $26,000.

Mr. **Sherley.** Will you spend the $26,000 which is unobligated?

Maj. **Embrick.** I think so.

Mr. **Sherley.** This $26,000 is supposed to cover the cost of mine cases, plugs, transformers, cable, explosive, junction boxes, anchors, buoys, rope and cordage, fittings, targets, tape, and sundry miscellaneous items?

Gen. **Weaver.** Yes; the material which is actually destroyed in exploding a mine.

Mr. **Sherley.** This item was introduced some years ago in order that the reserve of submarine mine matériel may not be annually depleted by virtue of the practice, and in order that we might accurately know what reserve material was on hand.

Gen. **Weaver.** Yes, sir.

SUBMARINE MINES PRACTICE.

Mr. **Sherley.** How much practice do you get?

Gen. **Weaver.** Each company fires two mines each year.

Mr. **Sherley.** What have been the results of the practice?

Gen. **Weaver.** They have been excellent. This table shows the firing for last year.

Mr. **Sherley.** I notice for last year your highest percentage was 100 and your lowest was 60, which would seem to indicate that your practice was very satisfactory.

Gen. **Weaver.** Yes; mine practice has always been satisfactory. As a matter of fact, the officers feel chagrined if they do not get 100 per cent of hits.

Mr. **Sherley.** Of course this is firing with fixed mines within a plotted area, and the only question of determination is the range of the target at the time the mine is exploded?

Gen. **Weaver.** That is all; except that our practice charges of explosive are not as large as those that will be used in some cases in war. Then, too, the targets we employ in practice are much smaller than those against which we would discharge the mines in time of war. I think we may assume that in war our percentage of hits will be fully as great as in practice.

Mr. **Sherley.** This relates, of course, to fixed mines?

Gen. **Weaver.** Yes, sir.

Mr. **Sherley.** Has there been any development in the character of the fixed mine?

Gen. **Weaver.** There is quite an important improvement in process of development at the present time, although not finally perfected. There are some places where the swing of the tide is very large, especially at the Pacific end of the Panama Canal and at Long Island Sound.

Mr. **Sherley.** And up in Washington also?

Gen. **Weaver.** At Puget Sound there are other difficulties on account of depth of water, swiftness of current, etc. A mine has been developed that may be automatically adjusted for a certain submergence, and as the tide changes it will rise and fall with the tide, so as always to be the proper distance below the surface of the water. This type is the controlled submergence mine, and it will be of considerable value. There have been developed mines of this type adapted to water of the character found at the Pacific end of the canal, and they will be purchased for that locality out of the appropriation in the last sundry civil bill. Of the money appropriated heretofore under the next item for the purchase of mines, $100,000 has been reserved awaiting the adaptation of this type of mine to the waters of Long Island Sound, but as that matter is still in suspension and we will not be able to use the money for that purpose for another year, when we come to the next item I shall suggest that no appropriation be made for 1918.

Mr. **Sherley.** Before we take up just that phase of it, let me ask you something more about the practice. Do you from this fund pay any of the expenses of practice in mine laying or do you have any such practice?

Gen. **Weaver.** The only expense incident to mine practice charged to this appropriation is that growing out of the partial or total destruction of the material employed in the practice.

Mr. **Sherley.** How often do you have practice in mine planting?

Gen. **Weaver.** Practice in mine planting occurs at posts constantly throughout the year, under the control of the officers stationed there; and, in addition, there is practical instruction in laying mines in connection with the visit of the mine planters which move along the coast and visit annually the different stations.

Mr. **Sherley.** How many planters have you?

Gen. **Weaver.** There are eight at present and one additional authorized.

Mr. **Sherley.** Where are they stationed?

Gen. **Weaver.** Four on the Atlantic coast, two on the Pacific coast, two in the Philippines. The new one will be assigned to Panama.

Mr. **Sherley.** None in the Hawaiian Islands?

Gen. **Weaver.** No; we have asked that an estimate be submitted for one for those islands.

Mr. **Sherley.** What is the need of having one down at Panama?

Gen. **Weaver.** It is thought that the conditions there may be of such an emergency nature that it will be necessary to have the whole mining equipment available for instant use.

Mr. **Sherley.** You have got a good many vessels down there which would be available for this purpose?

Gen. **Weaver.** Unless they were equipped with the special apparatus necessary for planting mines they would have to be so equipped after war becomes imminent.

Mr. **Sherley**. It is simply a question of whether or not one of them could not be so prepared, without interfering with its ordinary functions, and not put the Government to the expense of maintaining an extra mine planter.

Gen. **Weaver**. On the other hand, why not provide a mine planter and let it do the additional artillery work?

Mr. **Sherley**. No reason at all, if you had it, but I expect what happened is that you just added one more ship to the number which the Government owns at Panama.

Gen. **Weaver**. My understanding is that the one to be assigned to Panama and also the one we are asking for Honolulu will, in addition to mine planting, be serviceable also for general artillery purposes.

Mr. **Sherley**. Oh, yes; but the question is whether or not they have vessels enough now at Panama to do both of those things.

Gen. **Weaver**. They tell us they have not.

Mr. **Sherley**. They will never tell you they have, General. I have never known any department that was ever willing to admit it could give up anything for the use of any other department.

Gen. **Weaver**. We have tried to get from the Quartermaster Department a boat for this purpose, both at Panama and Hawaii, and they have reported that there are no boats available.

PURCHASE OF SUBMARINE MINES—UNITED STATES.

Mr. **Sherley**. General, the next item is:

> For purchase of submarine mines and necessary appliances to operate them for closing the channels leading to our principal seaports, and for continuing torpedo experiments.

Last year you asked for $596,231, and you got $123,000.

Gen. **Weaver**. Yes, sir.

Mr. **Sherley**. How have you gotten along?

Maj. **Embick**. $123,000 was for application to a number of localities, to complete practically the mine projects at those localities. Of that amount, $55,200 is being expended on operating boards, motor generators, storage batteries, rope, and other accessories, and $67,800 is reserved for expenditure on cable, bids for which will be asked probably in the near future, on the completion of the joint investigation now being conducted by the Bureau of Standards and the disbursing officer at the depot.

Mr. **Sherley**. Then you expect to expend all of it?

Maj. **Embick**. Yes, sir.

UNEXPENDED BALANCE.

Mr. **Sherley**. You had a big balance last year from the year before, did you not?

Maj. **Embick**. Yes, sir. We had a Treasury balance last year of $311,000, I think.

Mr. **Sherley**. On January 13 you had a balance of $317,331?

Maj. **Embick**. Yes, sir.

Mr. **Sherley**. So evidently you only spent about $6,000 between that date and July of last year.

Maj. **Embick.** Yes, sir.

Mr. **Sherley.** What did you do with the balance you carried over on July 1, 1916?

Maj. **Embick.** A part of that is being applied to the purchase of cable and other accessories, and the balance has been reserved for the following purposes: $100,000 for the purchase of special mine cases. $45,000 for automatic anchors for Long Island Sound, $24,000 for trotol, and the balance for cable and other accessories.

CABLE, UNITED STATES.

Mr. **Sherley.** How comes it you are spending some of it for cable now, and you just stated that as to moneys made available in last year's bill you were holding the money for cable in order to get a report from the Bureau of Standards?

Maj. **Embick.** Some cable was advertised for and contracts awarded about two years ago, but because of long delay in the procurement of material on the part of the manufacturer he was not able to deliver it in a shorter time. It is now being delivered.

Mr. **Sherley.** How about the inspection of that cable? Of course. you do inspect it before you accept it.

Maj. **Embick.** All cable is subjected to an acceptance test.

Mr. **Sherley.** I understand that; but in view of the fact that your old test did not protect the Government in the way of getting good cable, and in view of the fact that you are now conducting an experiment through the Bureau of Standards in order to determine what constitutes good cable and how to test it, how are you in position to so test this cable that you are receiving so as to protect the Government?

Maj. **Embick.** The acceptance test is based on the specifications of two years ago. The insulation compound is subjected to the most searching electrical, chemical, and physical tests that are deemed practicable.

Mr. **Sherley.** It may be that you will again find yourselves in the position of having bought some bad cable.

Gen. **Weaver.** My understanding is we are involved in this cable; that is, that a contract had been entered into as to its delivery.

Mr. **Sherley.** I understand that, General, but presumably your contract contemplated the supplying of cable of a certain quality that would last a certain length of time.

Gen. **Weaver.** The specifications do not call for a definite length of life, but the contractor guarantees to repair or replace defective parts within five years.

Mr. **Sherley.** The old cable you got, particularly that which you had over in the Tropics, went to pieces on you, and so you found yourselves with a considerable expenditure of money for cable that was not worth anything. What I am trying to get at is whether you may not be doing the same thing now.

Gen. **Weaver.** We are trying to avoid it in every possible way. The cable which deteriorated in the Philippine Islands was among the first cable that was used. It was sent over there years ago. In those days they used tarred jute in the insulation, which is not used at present. This question as to the life of cable has come up in the hearings each year.

Mr. **SHERLEY.** It came up particularly last year because we discovered a very unfortunate condition.

Gen. **WEAVER.** Yes; and this contract we are now referring to had been entered into too early to avoid it.

Mr. **SHERLEY.** That may or may not be. I could only answer that by seeing the contract.

Gen. **WEAVER.** By seeing the specifications.

Mr. **SHERLEY.** It appears that the date of delivery has been long delayed, which might have worked a forfeiture of the contract. I could not know that without seeing it. What I am trying to find out is whether any precautions have been taken in the testing of the cable to guarantee to the Government the securing of cable of proper quality, and in view of the fact that you have not yet received the report from the Bureau of Standards touching cable, how are you in position to really test this cable?

Gen. **WEAVER.** The specifications for the cable which has not been delivered were up to the standards of the time as then understood, and no material modification in these specifications has been suggested by the Bureau of Standards or by any of the other experts with whom the matter has been taken up. We could not go any further in the specifications.

Mr. **SHERLEY.** That might be true if your contract was binding on the Government; but I suspect that nearly every contract you make has a time delivery clause in it which would have enabled the Government either to cancel the contract or to make a new arrangement whereby the postponement of its receipt would be at such time as to enable you to take advantage of the information you are presumably going to get from the Bureau of Standards.

Gen. **WEAVER.** Then there arises another question: that is, to what extent we could postpone this purchase in view of the condition of the cable in the Philippines?

Mr. **SHERLEY.** Let us take it up from another angle: What have you done to hurry up the report of the Bureau of Standards?

Maj. **EMBICK.** The disbursing officer at the torpedo station has been in constant communication with the Bureau of Standards, and we had hoped to have the new specifications completed before this.

Mr. **SHERLEY.** When did you take it up with the Bureau of Standards?

Maj. **EMBICK.** Over a year ago.

Mr. **SHERLEY.** Have they been advised, in the meanwhile, that you were accepting cable, and that it was a matter of great importance to know whether it was good cable or not?

Maj. **EMBICK.** Yes; and they have tested samples of this cable and reported that it conforms to specifications.

Mr. **SHERLEY.** How much of this cable that was provided for prior to last year's appropriation has been received and accepted?

Maj. **EMBICK.** All of this cable that is referred to now was purchased out of appropriations prior to last year's act.

Mr. **SHERLEY.** How much of it in money value has been received and accepted?

Maj. EMBICK. I do not know. It is now being delivered at the rate of 5 miles every 10 days to the depot at Fort Totten, N. Y.

Mr. SHERLEY. Do you know whether or not any of it has been?

Maj. EMBICK. Over half of it has been delivered.

Mr. SHERLEY. What have you done with it?

Maj. EMBICK. It has been shipped to various localities that are short on cable.

Mr. SHERLEY. In this country?

Maj. EMBICK. Yes, sir.

CABLE, PHILIPPINES.

Mr. SHERLEY. Then you have supplied the station in the Philippines by sending them cable out of your reserve here?

Maj. EMBICK. No, sir. I referred only to cable purchased from this appropriation. In addition we are purchasing cable to the value of $40,000 for the Philippines under appropriations made prior to last year.

Mr. SHERLEY. You do not know whether that has been sent to the Philippines?

Maj. EMBICK. It has been shipped.

Mr. SHERLEY. You do not know how soon you will get that report from the Bureau of Standards?

Gen. WEAVER. We have been expecting it every day. I am afraid that they think we are importunate now, but we will take it up again right away.

Mr. SHERLEY. The rest of that $311,000 was expended for material other than cable, I believe you stated?

Maj. EMBICK. There has been reserved $100,000 for special mine cases and $45,000 for automatic anchors for Long Island Sound; $24,000 for trotol——

Mr. SHERLEY. Making a total of——

Maj. EMBICK (interposing). $169,000.

Mr. SHERLEY. And you had $142,000 for cable?

Maj. EMBICK. Reserved for cable and other accessories. That has not been expended.

Mr. SHERLEY. We must be talking about different sums now You had last year on the 1st of July, $311,000.

Maj. EMBICK. Which is not expended.

Mr. SHERLEY. None of it?

Maj. EMBICK. Only a small part has been expended.

Mr. SHERLEY. On cable?

Maj. EMBICK. Largely on cable.

Mr. SHERLEY. That is the cable that has been received?

Maj. EMBICK. Yes, sir.

Mr. SHERLEY. And the rest of it you are holding——

Maj. EMBICK (interposing). Waiting for the new specifications t be compelted.

Mr. SHERLEY. Along with this $123,000, have you spent any o that you got last year?

Maj. EMBICK. A part of that—$55,000—is being expended f material other than cable, and the rest of it will be spent for ca upon the completion of the new specifications. I think it should stated, in this connection, that the development of our mine cable has been marked by constant progress and improvement from year to year, and that the specifications issued for its manufacture by the torpedo depot are fully abreast of the state of the art at the time. The disbursing officers at the torpedo depot who have immediate charge of this material have been pioneers in the development of this kind of cable and in interesting cable manufacturers throughout the country in the subject. Of course, we hope to obtain further improvement through the investigation now being conducted by the Bureau of Standards, but we feel sure that the cable we are now getting is a great improvement over that which showed up so badly in the Philippine Islands.

Mr. **Sherley.** Still, it would be worth while to have that opinion confirmed. A good deal of this money you are not expending is intended for anchors?

Gen. **Weaver.** Yes, sir.

Mr. **Sherley.** Why?

Gen. **Weaver.** Because of the continuance of experiments for the perfection of an anchor adapted to the waters of the eastern entrance of Long Island Sound. The experiments will probably continue for some months longer. The $100,000 we have been reserving for special mine cases for that locality is now available for other assignment, and I suggest that the estimate of $83,000 we are asking for this year for the Los Angeles mine project be dropped, and that there be an understanding that the $100,000 that we have been reserving for the submergence-controlled mine be considered available for the Los Angeles project.

FLOATING MINES.

Mr. **Sherley.** Are you doing anything with regard to floating mines?

Gen. **Weaver.** No, sir. We have made no arrangements for floating mines. The mining of water areas so far beyond the fortifications that the mine field could not be controlled by shore guns is a matter that is assigned to the Navy.

Mr. **Sherley.** On the theory that any mine laying outside of that area would be ineffectual unless protected by the Navy because of the ability of the enemy to sweep it or clear it?

Gen. **Weaver.** Yes. And also because of the distribution of mine defense functions.

Mr. **Sherley.** How much mine material in money value is it necessary to have in order to complete the reserve supply contemplated under the project of the Board of Review?

CAPE HENRY, LONG ISLAND SOUND, LOS ANGELES.

Gen. **Weaver.** $893,000, which is largely for the equipment of Cape Henry, Long Island Sound, Los Angeles, and the Kennebec. This estimate is based on prices obtaining 18 months ago. Prices at present are much higher, and if they remain in future at their present level this total will have to be increased materially.

Mr. **Sherley.** How much mine material have you on hand now?

Gen. **Weaver.** The total value of the mine material on hand in continental United States, including that to be purchased with available funds, is $2,597,917.67.

Mr. **Sherley.** You have practically all of the mine material necessary to comply with the project of the Board of Review for all areas around existing fortifications, except New York and the Kennebec River?

Gen. **Weaver.** Long Island Sound, the Kennebec River, Cape Henry, and Los Angeles.

Mr. **Sherley.** Of course, Cape Henry is not fortified now.

Gen. **Weaver.** Then, for all except the Kennebec River, Long Island Sound, and Los Angeles, except minor items, and, of course, such replacements as may be necessary in future.

Mr. **Sherley.** Touching the insular possessions, are you supplied with all of the necessary mine material for the defense of mine areas there?

Gen. **Weaver.** Yes, sir.

Mr. **Sherley.** And at Panama?

Gen. **Weaver.** Yes, sir; that is practically completed.

Mr. **Sherley.** So that if your mine defense is not adequate it is because of the project that has been developed for it?

Gen. **Weaver.** It is because we have not asked for it.

Mr. **Sherley.** You have got all that you have asked.

Gen. **Weaver.** Yes, sir; with the exceptions that I have noted.

MAINTENANCE OF SUBMARINE MINE MATÉRIEL, UNITED STATES.

Mr. **Sherley.** The next item is for the maintenance of submarine mine matériel within the limits of continental United States, purchase of necessary machinery, tools, and implements for the repair shop of the torpedo depot at Fort Totten, etc. You are asking the usual sum of $68,000. What is the condition of your balance?

UNEXPENDED BALANCE.

Maj. **Embick.** The Treasury balance on December 1 was $82,170.27, and the unobligated balance was $56,727.99.

Mr. **Sherley.** How much money did you carry over from the 1st of July?

Maj. **Embick.** I have no statement of that here.

Mr. **Sherley.** It must have been quite a little sum, because at the present time you have $14,000 more money than the appropriation, and you have money unobligated within $12,000 of the appropriation.

Maj. **Embick.** Yes, sir.

Mr. **Sherley.** That would indicate that we have given you more money than you needed.

Maj. **Embick.** Some of that money is being held up for the replacement of cable, and will not be expended until the completion of the new specifications.

Mr. **Sherley.** How much is being held up for that purpose?

Maj. **Embick.** $10,000.

Mr. **Sherley.** Do you mean of the new $68,000?

Maj. **Embick.** Of the old $68,000.

Mr. **Sherley.** Of last year?

Maj. **Embick.** Yes, sir; $10,000 of that was for cable.

Mr. **Sherley.** Of course you undertake to buy out of this item just the quantity of cable that is destroyed?

Gen. **Weaver.** Yes.

Mr. **Sherley.** You replace that lost by destruction, deterioration, or otherwise. In other words, you are not trying to increase your reserve from this maintenance item?

Gen. **Weaver.** No, sir: that is intended strictly for replacement and maintenance purposes, and not for increasing the quantity of mine material that is required by the different projects.

Mr. **Sherley.** What knowledge have you as to the physical condition of the cable you have in reserve?

Gen. **Weaver.** We have quite accurate information on that. Insulation tests are made twice a year.

Mr. **Sherley.** How?

Gen. **Weaver.** They are made by electrical measurements.

Mr. **Sherley.** Throughout the entire cable?

Gen. **Weaver.** Yes.

Mr. **Sherley.** How much cable have you in reserve?

Gen. **Weaver.** Only 3 miles.

Mr. **Sherley.** This cable is kept submerged?

Gen. **Weaver.** Yes, sir.

Mr. **Sherley.** Water being a better preservative for it than air?

Gen. **Weaver.** Yes, sir. The cable is kept submerged in salt water.

Mr. **Sherley.** Is salt water better for the purpose than fresh water?

Gen. **Weaver.** So far as known there is no difference.

FORT TOTTEN, N. Y.

Mr. **Sherley.** How much of this fund do you spend for the maintenance of the torpedo depot at Fort Totten?

Gen. **Weaver.** About $8,000.

SUBMARINE MINES, INSULAR POSSESSIONS.

Mr. **Sherley.** General, you are not asking this year for any submarine mines or appliances to operate them for the insular possessions?

Gen. **Weaver.** No; there is nothing required.

Mr. **Sherley.** You got $138,100 last year. What have you done with it?

UNEXPENDED BALANCE.

Maj. **Embick.** The Treasury balance under that appropriation is $138,395.43.

Mr. **Sherley.** You seem to have more money than you got?

Maj. **Embick.** $295.43 was carried over from the appropriation of the previous year.

Mr. **Sherley.** Was that the balance carried over from the year before?

Maj. **Embick.** Yes, sir; $295.43.

Mr. **Sherley.** Why have you not spent any of this money?

Maj. **Embick**. Of that amount—$138,100—$107,000 is for the purchase of cable.

Mr. **Sherley**. How about the balance?

Maj. **Embick**. $12,250 is for the purchase of trotol. The purchase of that has been delayed because the price of trotol has increased to from six to eight times its normal value, and it is almost impossible to get it. We hope that condition will be improved, however, in the near future. The balance, $18,750, is for mooring rope, which is in process of being purchased.

Mr. **Sherley**. That explains why you are not asking for anything now. Have you completed your scheme?

Gen. **Weaver**. Yes; the scheme for the insular possessions has been completed.

MAINTENANCE OF SUBMARINE MINE MATERIAL, INSULAR POSSESSIONS.

Mr. **Sherley**. The next item is:

For maintenance of the submarine mine material in the insular possessions.

You asked last year for $10,750 and you got $10,000. This year you are asking $10,750. How are you getting along with the $10,000?

UNEXPENDED BALANCE.

Maj. **Embick**. We have a Treasury balance of $5,987.15, which is a free balance at present.

Mr. **Sherley**. How much money was carried over on July 1, this year?

Maj. **Embick**. $2,020.02.

Mr. **Sherley**. If you got along last year on $7,500 you evidently will more than get along on $10,000 this year?

Gen. **Weaver**. You know that this estimate is based upon a series of investigations, extending over a number of years, as to the amount needed for maintenance.

Mr. **Sherley**. We have never given you what you asked yet you have managed to get along, although last year we did increase the amount by $2,500 on account of a rather pathetic plea that was made, and it looks as though you will not need quite that much.

Gen. **Weaver**. I was unable to say why the whole amount was not used.

Mr. **Sherley**. Probably because there was not the maintenance necessity, General.

Gen. **Weaver**. How much was the balance?

Maj. **Embick**. We have a balance of now of less than $6,000 out of the $10,000 appropriated.

Gen. **Weaver**. And that must last us until the 1st of July.

CONSTRUCTION OF FIRE-CONTROL STATIONS AND ACCESSORIES, INSULAR POSSESSIONS.

Mr. **Sherley**. The next item is:

For construction of fire-control stations and accessories, including purchase of lands and rights of way, purchase and installation of necessary lines and means of electrical communication, including telephones, dial and other telegraphs, wiring and all special instruments, apparatus, and materials, con signal apparatus, and salaries of electrical experts, engineers, and other necessary employees connected with the use of coast artillery; purchase, manufacture, and test of range finders and other instruments for fire control at the fortifications, and the machinery necessary for their manufacture at the arsenals.

You are asking for $31,537.50. Last year you asked for $112,050 and got $100,000.

Gen. **Weaver.** That is for the purchase of 15 azimuth instruments, 8 coincidence range finders, and 31 depression position finders for the Philippine Islands, and for the Hawaiian Islands, 26 azimuth instruments, 2 coincidence range finders, and 5 depression position finders.

Mr. **Sherley.** Was that not expected to cover the whole project?

Gen. **Weaver.** Is was, with the exception of the new 12-inch batteries for long-range firing and the Caballo mortar battery. The estimate this year is for fire-control instruments for these batteries.

Mr. **Sherley.** What does it amount to?

Gen. **Weaver.** It amounts to $31,537.50.

Mr. **Sherley.** So that we really saved $12,000 by cutting you last year?

Gen. **Weaver.** I suppose so.

Mr. **Sherley.** Will this clean up your project?

Gen. **Weaver.** Yes; with the exception of the work of the engineer and signal corps for those batteries.

Mr. **Sherley.** What about the balance out of the funds appropriated last year?

Maj. **Embick.** There is no unallotted balance in the hands of the War Department; all has been allotted to the staff departments, and while there are unallotted balances in each of those departments, they are practically all obligated for work in hand.

FORTIFICATION OF ALASKA.

Mr. **Sherley.** General, have any further steps been taken looking to the fortification of Alaska?

Gen. **Weaver.** I do not know just what you mean by the word "further." We have never taken any steps.

Mr. **Sherley.** I understood that the matter was under discussion last year?

Gen. **Weaver.** Yes.

Mr. **Sherley.** And presumed that perhaps some conclusion would be reached by now?

Gen. **Weaver.** The Chief of Coast Artillery presented to the Board of Review a project looking to the defense against naval attack of Cook Inlet and Resurrection Bay, the two navigable water approaches to the new railroad.

Mr. **Sherley.** But it never has reached the point of a board being created to devise plans?

Gen. **Weaver.** No. The Board of Review held the matter under advisement, and it is now before it to be taken up at any time that seems opportune.

Mr. **Sherley.** If fortifications are to be placed there in order to have them completed as soon as the railroad is completed, it would be necessary to begin construction very shortly, would it not?

Gen. WEAVER. Yes. My personal opinion is that the matter ought to be taken up immediately as one of the live projects.

Mr. SHERLEY. It would take at least six years, judging by the past, and probably longer, before the fortifications were completed?

Gen. WEAVER. Yes, sir.

Mr. SHERLEY. In that time, presumably, this railroad is going to be finished?

Gen. WEAVER. I think it will be finished before that time.

Mr. SHERLEY. So it would seem that you gentlemen are a little tardy, assuming that you are going to fortify?

Gen. WEAVER. Personally, I think it ought to be fortified, and I think it ought to be taken up as a project to be settled at once.

Mr. SHERLEY. Do you know whether the Danish West Indies are fortified?

Gen. WEAVER. I think they have no fortifications that we would consider effective.

Mr. SHERLEY. In the event of their acquisition—and I see by the press that the referendum held by Denmark is in favor of their sale—would we need to fortify them?

Gen. WEAVER. It seems to me probable that their fortification will become necessary if any naval utilities are to be located there.

FRIDAY, DECEMBER 15, 1916.

STATEMENT OF BRIG. GEN. GEORGE P. SCRIVEN, CHIEF SIGNAL OFFICER, ACCOMPANIED BY MAJ. CHARLES S. WALLACE.

OPERATION AND MAINTENANCE OF FIRE-CONTROL INSTALLATIONS—UNITED STATES.

Mr. SHERLEY. General, the first item under the Chief Signal Officer is found on page 34 of the bill:

> For operation and maintenance of fire-control installations at seacoast defenses.

You are asking for $150,000.

Gen. SCRIVEN. Yes, sir.

Mr. SHERLEY. Last year you asked for $130,000 and $130,000 was appropriated?

Gen. SCRIVEN. Yes, sir.

UNEXPENDED BALANCE.

Mr. SHERLEY. What balance, if any, did you get from the previous year's appropriation on the 1st of July last?

Gen. SCRIVEN. The appropriation was $130,000 and we had a balance from the fiscal year 1916 of $6,792.56, which gave a total of $136,792.56. There was transferred to Chief of Engineers for maintenance in this country, $400, which gave a net balance of $136.392.56. Of that amount there was obligated for salaries, $38,665.09; incidental expenditures by departments and depots, $17.412.77; district signal stations, including all radio and visual signaling equipment

$6,246.65; submarine cables and reels, $17,310.50; aerial and subterranean cables and reels, $12,532; post telephone systems, $242.56; fire-control apparatus, including telephones, time interval, and meteorological equipment, zone and firing signals, $53.09; power equipment, including generators, storage batteries, power switchboards, etc., $115.43; testing instruments and tools, $1,566.28; construction and other expendable material, including wire, poles, dry cells, etc., $20,220.38; photo supplies, except laboratory, $60.50; laboratory, $780.37; miscellaneous expenses not properly chargeable to other classifications, $494.36. For the cable ship *Joseph Henry*, salaries, $4,160; supplies and incidental expenses, $665.65, making a total of $120,525.63, with a free balance on December 1 of $15,866.93.

Mr. Sherley. Do you mean that the other amount has been actually expended or has been obligated?

Gen. Scriven. Obligated. Of course, the salaries are carried on to the end of the year. This gives us too small a balance for the rest of the year, and that is why we are asking for more money next year. We have tried an appropriation of $130,000. We tried it two years ago. I remember you changed it from $180,000 to $130,000, and we ran on for two years in that way.

For several years prior to the year 1915, $180,000 was appropriated for the maintenance of fire-control installations in the United States. In view of the gradual accumulation of savings due to the fact that several of the systems were practically new, and that the more expensive rubber-insulated cables were gradually replaced by less expensive paper-insulated cables, the unexpended balance in the year 1914 amounted to $30,283.47. The appropriation for 1915 was therefore reduced to $130,000, and the same amount has been appropriated for each succeeding year; that is, for 1915, 1916, and 1917, if you remember.

Mr. Sherley. Yes; and apparently you have not suffered any loss as a result.

Gen. Scriven. No; we have not; but now we have gotten down to $15,000 for the rest of this year.

Mr. Sherley. But last year you had $6,000 left over.

Gen. Scriven. Yes; $6,792.

Mr. Sherley. Now, what makes you think that this coming year you have got to spend $26,000 more money?

Gen. Scriven. You see, we had that $30,000 extra.

Mr. Sherley. No; you did not have that much of it at that stage. How much was your balance credited with on July 1, 1915?

Maj. Wallace. We then had a balance of $5,327.

Mr. Sherley. So that you actually spent for the year ending July 1, 1916, $129,000, so that the fact that your balances have disappeared does not cut any figure.

Gen. Scriven. But now it is in December and we are down to $15,000, and that is a pretty small amount to run on.

Mr. Sherley. Unless you have already taken care of everything.

Gen. Scriven. There is Panama——

Mr. Sherley (interposing). This has nothing to do with Panama.

Gen. Scriven. I will come to that later on. It seemed to be a wise thing not to bring in a deficiency.

Mr. SHERLEY. I understand that; but I do not see any reason why you should fear a deficiency. What has there been this year of greater expense than last year?

Gen. SCRIVEN. How much has been our average expenditure for the last three years?

Maj. WALLACE. When we first had $130,000 that year we had $30,000 in round numbers left over from the year when we had $180,000. The balance which we have had left over has gotten less every July until last year it was only $5,000.

Mr. SHERLEY. We had not educated you in economy that first year. Now, the fact is, in 1915 you had a balance of $5,000.

Maj. WALLACE. Yes, sir.

Mr. SHERLEY. And in 1916 you have a balance of $6,000, so it shows that for that year you actually ran $1,000 under your appropriation of $130,000, and your old balances do not have anything to do with it.

Maj. WALLACE. Every year the amount of material we have put into the reserve of surplus purchases has grown less. Our stock on hand has been less every year.

Mr. SHERLEY. This has nothing to do with a reserve?

Maj. WALLACE. Yes.

Mr. SHERLEY. It ought not to have.

Maj. WALLACE. We buy out of this appropriation. For instance, we get a requisition for 1 mile of cable, which is of standard make and which we use in a number of installations. We do not buy that 1 mile but we buy 5 or 6 miles and put some of it away, and we draw every year from these reserve stores. When a cable goes down we can not wait to have the cable manufactured, because it would take five or six months. We have to have cable forwarded from some of our storehouses, and this reserve cable has been getting less and less every year.

Mr. SHERLEY. If that is the case you people have not been living up to the requirements of these appropriations.

Maj. WALLACE. It is because our appropriation has not allowed us to purchase it.

Mr. SHERLEY. No; it is nothing of the kind, if you will pardon me. This is a maintenance item. It is carried as a separate item, with the idea not that you will build up a reserve, but is to take care of the draft on the reserve which is made, so that you can substitute in kind.

Maj. WALLACE. We have not had the money to do that since you have reduced the appropriation.

Mr. SHERLEY. If you have not, you ought to have so stated.

Maj. WALLACE. We are stating it now.

Mr. SHERLEY. But you say your reserve has been gone into.

Maj. WALLACE. It has.

Gen. SCRIVEN. It does not mean a reserve in that sense. It simply means the amount of material on hand that can be used for any purpose. For instance, the Navy Department or the Weather Bureau comes to us and says that there is a cable on the Pacific for which they want to borrow a mile or two of cable. We have to have a certain reasonable amount of that on hand to use at once in an emergency.

Mr. SHERLEY. Do they not pay you for what they get?

Gen. SCRIVEN. Yes.

Mr. SHERLEY. Do you not buy immediately?

Gen. SCRIVEN. Yes; but it takes months to buy it. I have been trying to buy some electrical apparatus since last May.

Mr. SHERLEY. Then it is not a question of money; it is simply a question of time?

Gen. SCRIVEN. Yes; it is a question of time; but we have to keep a certain reasonable amount on hand so as to avoid any delay.

Mr. SHERLEY. But you will have that amount as soon as these orders are filled.

Gen. SCRIVEN. We get it back, but we are now down to this very small amount.

Mr. SHERLEY. Let us not get away from this other proposition.

Gen. SCRIVEN. I am trying to lead up to it. We have that much money to use for stuff that will be called for in an emergency. If we cut it down to no money at all, at the end of the fiscal year we can not place any orders for anything that is necessary.

Mr. SHERLEY. General, I understand from your statement that the supply of material that you keep on hand in order to fill requisitions made from the various fortifications is diminishing and that, in order to restore it to a size sufficient, in your judgment, to promptly meet requisions in the field, an additional sum of money should be appropriated. Now, General, in order that that may show, will you state in the hearings, when you come to correct them, the amount in value of the material you have on hand that belongs to the fortifications of continental America and the amount you have had for a year or two previously, so that the committee can actually see what, in money value, has been the drain upon this material that you have not been able to make good by the annual appropriations?

Gen. SCRIVEN. Yes, sir; we will be glad to do so; but, if you will recall, there has been a tremendous advance in price, and I would like to know whether you want it stated in terms of the cost price when it was bought or in terms of its present value, if it were to be bought now.

Mr. SHERLEY. I want it stated with a constant unit so it will not be misleading. I do not care which you take. In other words, if you got a certain amount less of material, you can state it both in money value and in terms of quantity.

Maj. WALLACE. We would have to use the old values.

Gen. SCRIVEN. We can do that; but what I am getting at is another point, perhaps, and that is the need for a larger appropriation, as the prices stand to-day, than was formerly the case, because, for instance, copper has gone up to 35 cents per pound.

Mr. SHERLEY. I think that is a legitimate element.

Gen. WEAVER. May I suggest that the total estimates submitted for the coast fortifications will be an item in it?

Mr. SHERLEY. I will be glad if you will have in it the total that comes from the fortifications.

Gen. SCRIVEN. Yes, sir.

(The statement referred to is as follows:)

On December 11, 1913, it was testified before your committee that the estimated value of material stored for the use of fire control was	$203, 024. 93
On February 11, 1915, it was testified before your committee that the estimated value of material stored for the use of fire control was	197, 221. 06
The present estimated value of such material in storage is	142, 805. 16

This includes approximately 8,000 items, consisting principally of cable, telephones, time-interval bells, zone signal equipment, storage batteries, and other similar equipment for these installations.

As an example of the increased cost of material, the following is cited:

	1914	1916
10-pair paper-insulated cable (type 401), cost per 1,000 feet	$66.00	$122.00
Single pair rubber-insulated and armored cable (type 251), cost per 1,000 feet	62.50	107.40
10-pair paper-insulated and armored cable (type 321), cost per 1,000 feet	201.00	430.00

A number of the older-type systems have been more or less modernized. The older composite Artillery type telephones have been replaced by the later type common battery instruments which have been especially designed to withstand weather conditions and concussions of the large guns.

Reserve cable and apparatus on hand—Fire control.

Coast defenses.	Amount.	Value.	Coast defenses.	Amount.	Value.
	Feet.			*Feet.*	
Portland	21,172	$7,233.55	Mobile	112	$10.08
Portsmouth	2,343	585.75	Galveston	10,145	1,417.30
Boston	10,968	3,427.11	San Diego	1,118	156.52
New Bedford	341	38.60	San Francisco	11,300	2,912.40
Narragansett Bay	4,825	1,343.90	Puget Sound	39,076	14,119.86
Eastern New York	5,150	665.96	The Columbia	55,647	13,001.55
Southern New York	1,291	246.69	Oahu	18,614	3,609.08
Sandy Hook	1,447	416.70			
The Delaware	2,250	462.61	Total	212,563	56,549.36
Baltimore	11,837	3,679.16	In supply depots	118,555	23,354.67
Chesapeake Bay	8,453	1,811.36			
The Cape Fear	341	62.92	Total cable in reserve	[1] 331,118	79,904.03
Charleston	3,389	811.45	Apparatus		62,901.13
Savannah	347	62.46			
Pensacola	2,397	474.35	Aggregate		142,805.16

[1] 62.7 miles.

This statement embraces about 125 different types of cable; at the present time, however, the number of types being used by the Signal Corps has been considerably decreased.

ALLOTMENTS FOR CLERICAL AND LABOR SERVICES.

Mr. SHERLEY. Have you the same arrangement that you have had heretofore for allotments for the expense of clerical and labor forces? You get, of course, very large funds from the Army bill?

Gen. SCRIVEN. Yes, sir.

Mr. SHERLEY. You have heretofore testified that you took the portion of the work that was done on behalf of the fortifications and charged the proportionate part of the salaries of the men engaged on that work to that item?

Gen. SCRIVEN. Yes, sir. There was a very large increase in the clerical force of the Signal Corps. It was provided for aviation, the Engineer Department, and the Signal Corps proper.

Maj. WALLACE. We have reallotted that money practically sometimes twice a year, depending on the character of the work. We pay the men for clerical work and get it out of the appropriation under which the work is provided for.

Gen. SCRIVEN. That has been very carefully worked out.

Mr. **Sherley**. This year you testified that the salary amount is $38,665.

Gen. **Scriven**. That was last year.

Mr. **Sherley**. It is this year. You testified a few minutes ago that that salary amount was $38,665.

Gen. **Scriven**. Yes, sir.

Mr. **Sherley**. That salary amount is for the entire year?

Gen. **Scriven**. Yes, sir.

Mr. **Sherley**. Last year you testified that your salary amount would be $66,224, and the year before it was $68,556.

Maj. **Wallace**. That comes from the Artillery. They are taking over the repair work, and the Engineers are taking over the construction work, and that has allowed us to reduce the number of our employees.

Mr. **Sherley**. So that you have made a saving in your salary item of $22,000?

Maj. **Wallace**. $4,000 is to be added to that——

Mr. **Sherley** (interposing). If you add $4,000, it would still leave you $18,000. Now, that ought to give you a good deal of leeway.

Maj. **Wallace**. Yes, sir; but we have got quite a number of electrical engineers that we use in the field.

Mr. **Sherley**. But you have $18,000 more money that you can spend for material, and you told me you have been depleting your supplies or stock.

Gen. **Scriven**. You see we are simply disbursing and not installing. We do not do this work. We fill the requisitions, but do not install the work.

Mr. **Sherley**. Has there been any great increase in the requisitions made on you?

Gen. **Scriven**. Not at all.

Mr. **Sherley**. Then what makes this trouble?

Maj. **Wallace**. The requisitions grow larger every year and the material we supply is more expensive. Prices are constantly going up, and as these installations become older they require more material.

Mr. **Sherley**. We, perhaps, can not get at that until we get this statement I have requested. Perhaps that will help explain the matter.

OPERATION AND MAINTENANCE OF FIRE-CONTROL INSTALLATION AT SEACOAST DEFENSES, INSULAR POSSESSIONS.

Mr. **Sherley**. General, the next item is for the same purpose, except that it relates to the insular possessions. You will find it on page 77 of the bill. Last year you asked for and received $10,000, and this year you are asking for $15,000. How much money did you have on July 1 under this item?

UNEXPENDED BALANCE.

Gen. **Scriven**. We had an unexpended balance of $653.92 at that time.

Mr. **Sherley**. What is the condition of your Treasury balance now?

Gen. **Scriven**. The Treasury balance free on December 1, 1916, was $4,677.81; the balance in possession of disbursing officers was $4,726.64; making a total of $9,404.45, with outstanding obligations amounting to $6,758.74, leaving a free balance of $2,645.71 on the 1st of December.

SALARY EXPENSE.

Mr. **Sherley**. How much of this sum goes to salaries?

Gen. **Scriven**. For salaries in the Philippine Department the amount obligated is $810; local expenditures in the Philippines, the amount obligated is $1,997.86; for salaries in the Hawaiian Department the amount obligated is $966.67; while for local expenditures in Hawaii the amount obligated is $455.45.

Mr. **Sherley**. Your estimate submitted here for salaries for next year is $2,647.

Gen. **Scriven**. In the Philippines?

Mr. **Sherley**. No; in all of the insular possessions.

Gen. **Scriven**. That is a difference of $800—about that.

Mr. **Sherley**. That is a difference of $800?

Gen. **Scriven**. Yes, sir.

Mr. **Sherley**. Will you have that increase in salaries?

Maj. **Wallace**. Do you mean whether the estimate was more than that?

Mr. **Sherley**. If you will look under the item there, you will see that under the law you have submitted a statement as to each of the estimated expenditures for 1918, and the amount estimated for salaries is $2,647.

Maj. **Wallace**. We had to send an additional engineer over there, and he is employed on fire-control work in the Philippines. That amount varies from time to time; but just to show you how it comes up in this case, we have sent a man over there.

Gen. **Weaver**. Does that have reference to El Fraille?

Maj. **Wallace**. Yes, sir; he is to get up some data that was asked for by the engineers.

Mr. **Sherley**. It is in connection with the fortifications?

Maj. **Wallace**. Yes, sir; in connection with the fortifications. Years ago we had three or four engineers over there, but since the work has been completed we have reduced the number down to only one or two.

Mr. **Sherley**. When you had two or three over there, your expense was only $2,471.

Maj. **Wallace**. Sometimes those people are on Signal Corps work, and then it is charged to that; but at other times they are put on fire-control work, and then they are paid proportionately from other funds, according to the work. They pay the men from the appropriations that they are working under.

STOCK ON HAND.

Mr. **Sherley**. You are asking $5,000 additional; have you depleted this stock?

Maj. **Wallace**. We keep practically no stock in the insular possessions. We keep it here, and we take from the stock for our fire-control installation in the United States and ship it to the Philippines. Then it is credited to the United States appropriation. The United States appropriation is credited to that money, and we keep very little stock in the Philippine Islands.

Mr. SHERLEY. I understand; but it is as broad as it is long. Supposedly, you must have a stock for the Philippines, just as you have for the United States, and I am asking you whether it has been depleted.

Maj. WALLACE. No, sir; because we do not keep any stock in the insular possessions. We send it from the United States and charge it up to them.

Mr. SHERLEY. I am not talking about what is in the Philippines. It is immaterial where it is, but presumably you keep on hand a certain stock from which to supply requisitions that may be made on you from the fortifications in the insular possessions?

Maj. WALLACE. Yes, sir.

Mr. SHERLEY. Now, has that stock been depleted, or not?

Maj. WALLACE. It has not been depleted, because there is no such stock. We send the property from the United States, or from the stock in the United States. When we get the requisitions, we send the articles to the Philippines, and then we carry that money against the funds of the insular possessions and credit the other funds for the United States. Therefore, we can not deplete that stock.

Mr. SHERLEY. I differ from you about not having it. You have a certain amount of stock that is available for both continental United States and the insular possessions from which you supply requisitions, and then you replenish it from the moneys that are given you annually as a maintenance fund?

Maj. WALLACE. Yes, sir.

Mr. SHERLEY. Now, when you were talking awhile ago about that stock, you spoke of it for continental United States?

Maj. WALLACE. Yes, sir.

Mr. SHERLEY. Is it not being depleted if it is excessively drawn on from the Philippines?

Maj. WALLACE. The continental United States stock may be depleted, but this depletion is caused by filling requisitions from abroad, but in that case we get the money back.

Mr. SHERLEY. Why do you ask for additional money?

Gen. SCRIVEN. I know of no reason except the higher cost of everything and the fact that the requisitions are increasing. Then, of course, is the fact that the systems are getting older and older and require more repairs. That is the only reason I know of for asking for more money. When we get reports saying that a thing is getting weaker and weaker we naturally expect that the requisitions will be larger.

Mr. SHERLEY. Are you buying cable now?

Gen. SCRIVEN. We have not bought much, if any, although I believe we buy every now and again. However, I do not think we have made any large purchases of cable.

Mr. SHERLEY. Do you buy the cable yourself or do you buy it through the Artillery?

Gen. SCRIVEN. We buy it ourselves.

Mr. SHERLEY. Do you inspect it yourselves?

Gen. SCRIVEN. Oh, yes.

Mr. SHERLEY. Have you taken any steps to ascertain whether your system of specifications and of inspections is sufficient to protect the Government in connection with the cable you buy?

Gen. SCRIVEN. We have had, I suppose, the best system of inspection in the country in connection with all of the cabel work for years.

Mr. SHERLEY. That is what we heard from another corps a while ago, and yet it developed that a good deal of the cable they bought had deteriorated so rapidly that we had to appropriate a great deal of money to replace it.

Gen. SCRIVEN. I heard of that, too; but I do not think you ever heard anything of that kind with regard to the Signal Corps.

Mr. SHERLEY. You may not have found it out.

Gen. SCRIVEN. No; and I do not think we will find it in that condition. As a matter of fact, the Insular Bureau is buying through us, and when I was on duty in New York I know that our system of inspection was about the best in the country, and that the cable we use is the best.

Mr. SHERLEY. Do you know to what extent, if at all, your specifications and system of inspection differ from the specifications and system of inspection pursued by the Artillery?

Gen SCRIVEN. I do not know of any difference at all; but I can give you our specifications, if you want them.

Mr. SHERLEY. Do you cooperate with them in the purchase of cable?

Gen. SCRIVEN. I do not think so; I do not think we buy their cable any more than they buy ours.

Gen. WEAVER. I think the cable they use is entirely different from the cable we use in our mine work.

Gen. SCRIVEN. We use a great deal of deep-sea cable, and in connection with the Alaskan waters——

Mr. SHERLEY. But the deep-sea cable is not so very different in the conditions it has to meet from the mine cable, is it?

Gen. SCRIVEN. Oh, yes; especially in Alaskan waters.

Mr. SHERLEY. In what way is it different?

Gen. SCRIVEN. It is different in all sorts of ways.

Maj. WALLACE. Our cable goes down and stays down, while the cable they use in connection with their mine work is taken up quite often, and that causes some difficulties.

Gen. WEAVER. I was just going to say that the deterioration in our mine cable comes about by reason of its constantly being taken up. That causes the rubber eventually to develop a lot of cracks.

Gen. SCRIVEN. The question of cables is a question of local conditions and local waters. For instance, out in the Philippines, the cables, on the shore ends particularly, where they are eaten by the toredo navalis and other marine animals, have to be armored or covered, or at least should be, with copper. Up in the Alaskan waters, although there is nothing of that kind, the cable must have a heavy armor and the cable can not be lifted up; it lies there as it is laid. So in different waters a different variety of cable must be used.

Maj. WALLACE. The telegraph cables that were laid in the Philippines as long ago as 1900 are still in operation by the insular government.

Mr. Sherley. How about the cable you use in fire-control installaation—how has it been lasting?

Gen. Scriven. I think it has been lasting pretty well; I do not remember of any that we have had to replace lately. That is true because the fire-control installation does not date so far back.

Mr. Sherley. You spoke of a constant increase in the number of requisitions that are made on you which rather suggested the idea that some of this material was wearing out?

Maj. Wallace. But that is more the apparatus than it is the cable.

Gen. Scriven. The cable itself is fairly permanent, but the apparatus, of course, wears out.

Maj. Wallace. If you lay the cable where there is no strong current, or where there is not much possibility of the cable striking against rocks, and so on, it will lie there for an indefinite period of years, but if there is much of a current or rocks against which it can strike there is a chance of its wearing out quickly.

Gen. Weaver. That is true of the Portland Harbor, where it goes to pieces on the rocks.

Maj. Wallace. Yes. Then, again, if you take it up to relay it or rehandle it, it is going to wear out; it does not stand handling.

Friday, December 15, 1916.

STATEMENT OF COL. GEORGE O. SQUIER, MEMBER NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS, UNITED STATES ARMY.

AERONAUTICS.

Mr. Sherley. Colonel, you have recently been put in charge of the aviation work of the Army, I believe?

Col. Squier. Yes, sir.

Mr. Sherley. For how long have you been thus detailed?

Col. Squier. Since the latter part of May, when I arrived from England, after a four years' tour of duty as military attaché in London.

Mr. Sherley. Last year rather large funds were appropriated in the Army appropriation bill for aeronautics. Do you recall the amount?

Col. Squier. $13,281,666.

Mr. Sherley. What was the language of that appropriation, if you have it?

Col. Squier. It covered a very few lines, and while I have not the exact language, it was in effect, "for the purchase, operation, maintenance, repair, etc., of airships and the necessary accessories connected therewith, not to exceed $13,281,666."

Mr. Sherley. It has been testified, in connection with the hearings on the fortification bill, that it was planned to establish a given number of squadrons for use in connection with the fortifications of America?

Col. Squier. Yes, sir.

Mr. Sherley. What is your program in that regard?

Col. Squier. We are at present planning for six squadrons.

AIRPLANE SQUADRONS.

Mr. **Sherley.** What constitutes a squadron?

Col. **Squier.** Twelve active airplanes in the air, with the accessories necessary. The airplanes for these six squadrons are already on order.

Mr. **Sherley.** Are they supposed to cover all of the fortifications?

Col. **Squier.** No, sir.

Mr. **Sherley.** To what extent?

Col. **Squier.** Just to start with, that is all. There has been no formal board convened to determine exactly where they will be stationed, but we had in mind when we ordered the equipment for six squadrons one for Chesapeake Bay; for instance, two for New York, one for Boston, one for Puget Sound, and one for San Francisco.

Mr. **Sherley.** That would, of course, leave a number of fortifications without any.

Col. **Squier.** Yes; but this is just to start the work.

Mr. **Sherley.** Was it believed that as many as 12 machines were necessary for a fortification?

Col. **Squier.** Not a single fortification, but a group of fortifications. The whole mouth of the Chesapeake Bay would, for instance, have a squadron serving that whole section of country.

DUTIES OF SQUADRONS.

Mr. **Sherley.** Perhaps it might be illuminating if you would outline to us just the function that you expect to be performed by these quadrons in connection with fortification work?

Col. **Squier.** The particular machines that we have ordered are twin-engine machines, the best that can be purchased in this country at present. They are intended to be used in conjunction with the other defenses at these points, but not exclusively for any particular fort. The coast defense commander would be in charge of the squadron, and the squadron would serve the combined forts. For instance, in New York Harbor the coast defense commander would have charge of the squadron assigned there. These machines can go out to sea a coupleof hundred miles or more for the purpose of scouting and obtaining information as to the approach of an enemy. They can alight on the water and depart from the water, and would serve in the way of reconnaissance. They are not fighting machines, especially, although they are armed and may be provided with bombs. They are chiefly reconnaissance machines to assist the defense commander and serve him directly; that is, all of the forts, of course.

Mr. **Sherley.** Is it the idea that the work of these aviators will be confined to supplying information to the commanders of the fortifications?

Col. **Squier.** Primarily, yes, sir. They will be directly under him, the squadron being immediately under the defense commander.

Mr. **Sherley.** Their duties will not, then, primarily relate in any way to the movement of mobile troops?

Col. **Squier.** No, sir; although these same squadrons may be used for other service. If we have a war which does not involve the coast defense, they could be detached to the mobile army; in fact, these six could be used with the Organized Militia divisions, 12 of which are already planned for, as you know.

Mr. Sherley. This is a tentative scheme that has not been finally approved by any board?

Col. Squier. That is right; yes, sir.

Mr. Sherley. Is it the result of consultation with the Coast Artillery people?

Col. Squier. Not formal consultation, but informal consultation for months. I have not actually written about it, and we have not had boards convene on it. As a matter of fact, the Chief of Coast Artillery can station these squadrons wherever he pleases, and I have only given you my thought as to where they might be stationed when organized.

Mr. Sherley. Do you contemplate ordering any additional machines for use by the Coast Artillery out of the funds that are now available?

Col. Squier. We will probably have all we can attend to with the six squadrons, and we will be very fortunate indeed if we can get these six squadrons this year, and we probably can not.

PERSONNEL OF SQUADRONS.

Mr. Sherley. What plan have you for the personnel for these machines?

Col. Squier. The personnel for these machines will come principally from the aerial reserve that was authorized in the last defense act.

Mr. Sherley. Do you contemplate the use of Coast Artillery officers?

Col. Squier. Yes, sir. We have now a considerable number of them being trained as military aviators. Also some enlisted men have been transferred.

Mr. Shirley. What I meant was whether it might not be desirable and, to some extent necessary, that these machines be manned by Coast Artillery officers or men familiar with Coast Artillery matters?

Col. Squier. It is very desirable that it should be so, and there will probably be some such officers.

Mr. Sherley. When do you anticipate actually creating these squadrons?

Col. Squier. This year, if possible. They are now well advanced; the machines are all ordered and the personnel, or a good deal of it, is in existence now.

Mr. Sherley. But that personnel has not been taken from the Coast Artillery?

Col. Squier. No, sir. The law does not permit it; it allows only 75 officers from the whole Regular Army.

Mr. Sherley. How many officers from the Coast Artillery have you of those 78?

Col. Squier. Perhaps a dozen; I do not know just at the moment what proportion we have of coast artillerymen, but quite a few. All officers are taken from the Army at large.

Mr. Sherley. Do you expect to assign them, to the extent that you have coast artillerymen, to these six squadrons?

Col. Squier. Yes; we will always do that as far as possible.

Mr. SHERLEY. You spoke of having enlisted men from the Coast Artillery?

Col. SQUIER. Yes, sir.

Mr. SHERLEY. Do you recall how many of those you have?

REGULAR FORCE.

Col. SQUIER. We just transferred not long ago in New York quite a considerable number. It is changing every day, and we take them over in quite large groups sometimes. I have not the exact number of the coast artillerymen. We are authorized, for the present, to have 1,800 men for the entire regular force.

Mr. SHERLEY. One of the things my questions are aimed at is to inquire whether it is ultimately in contemplation that these squadrons of hydroplanes shall be strictly a part of the coast-artillery defense and whether it is expected or thought desirable that they should be exclusively manned by men from that service, or whether it is simply a part of your general scheme of aeronautics and involves the stationing at these fortifications and perhaps providing barracks and quarters for them of men from other branches of the service?

Col. SQUIER. In my judgment, a certain portion of these air forces should be directly under the control and command of the Coast Artillery authorities, and the observers in these machines should undoubtedly be trained Artillery officers; not the pilots or drivers, but the observers. The driver can be any one.

Mr. SHERLEY. By taking the officers from the Artillery Corps and the men from the enlisted men in the Artillery it would not make necessary any additional arrangement for taking care of such officers and men, but would simply mean the detail of that number of men from the Artillery Corps?

Col. SQUIER. Yes; but you would have to increase the Coast Artillery accordingly, I assume.

Mr. SHERLEY. That might be so.

Col. SQUIER. I assume they could not dispense with any personnel they have now.

Mr. SHERLEY. Would these officers be continuously engaged in this work?

Col. SQUIER. Yes, sir; it requires their constant attention. It is a highly organized service, perhaps more so than any other branch of the service.

EQUIPMENT.

Mr. SHERLEY. What in the way of equipment, aside from the machines themselves, will be necessary at these various fortifications in order to properly take care of this matter?

Col. SQUIER. Very considerable equipment; in fact, the machines in a way are only a start. It is a very highly organized service. Perhaps we can get at it in this way: To give you an idea, a squadron of 12 units, with all its accessories for the mobile army, costs something like $800,000 at the present time, and to maintain that squadron in war costs, approximately, $600,000. This maintenance cost is so near the original cost that you can get an idea how expensive the service is. The reason is that airplanes wear out very quickly. They last about three months in actual service.

Mr. **Sherley**. You speak of that for the mobile army.

Col. **Squier**. Yes, sir; I took that as an example. Of course, it would vary somewhat.

Mr. **Sherley**. I was just going to ask you whether you thought it would be approximately the same for the squadrons in connection with the Coast Artillery?

Col. **Squier**. The machines themselves are more expensive, and the accessories would perhaps be slightly less, because you would not have to have the motor transportation. On the whole, I should say that would be about the cost for either type of squadron.

Mr. **Sherley**. Have you a detailed estimate as to the cost of these six squadrons?

Col. **Squier**. Yes, sir; I know what they have cost in this country.

Mr. **Sherley**. Have you undertaken to supply not only the hydroplanes but all the accessories for these six squadrons?

Col. **Squier**. Yes, sir; we supply everything.

Mr. **Sherley**. One of the reasons for this immediate inquiry is that heretofore it has been the policy of Congress to keep, outside of the pay of personnel, all of the matters pertaining to coast defenses in the fortifications bill, and to make provision through that bill for the purchase and installation of any armament and for any of the accessories. This might really be called a branch of fire control, in one sense.

Col. **Squier**. In one sense; yes, sir;

Mr. **Sherley**. While of course their scouting duty is not that; but subsequently, in the event of an actual attack by an enemy, these hydroplanes would be useful in the way of determining range and——

Col. **Squier** (interposing). Yes; "spotting" the shots.

Mr. **Sherley**. And reporting back information.

Col. **Squier**. That is what you use them for in addition to scouting.

Mr. **Sherley**. You say you have worked out in detail the cost of these squadrons?

ASSIGNMENT OF SQUADRONS.

Col. **Squier**. Yes, sir; as near as we can.

Mr. **Sherley**. Has authority been given for the assignment of them to the coast fortifications?

Col. **Squier**. No, sir; nothing formal. The law is very brief, just a few lines, and contemplates going ahead and developing as rapidly as possible. I suppose in other circumstances we would have gone through formal boards, and so on, but we have had to do things here by informal methods, in starting a new industry. The large appropriation is interpreted to mean that this country wants aviation developed quickly.

Mr. **Sherley**. By my questioning I am not meaning to express either criticism or approval one way or the other, but simply to try to ascertain the exact situation.

Col. **Squier**. Yes, sir; I understand that.

Mr. **Sherley**. You expect these squadrons to be actually in commission, you say, shortly?

Col. **Squier**. Well, it is hard to say when the machines can be delivered in this country. It is an industry which is uncertain, as you know. It has had to be built up from the bottom. The contracts are out, and deliveries are timed for some time this spring; and if we have good luck we will probably be pretty well on with the squadrons by the end of the present fiscal year.

Mr. Sherley. They are American machines?

Col. Squier. Yes, sir; everything is American.

Mr. Sherley. In that connection, in passing, have you been able to get a satisfactory engine of American make?

Col. Squier. The engine subject is in fairly satisfactory development now.

Mr. Sherley. Colonel, are you asking anything this year in the way of funds for the creation of squadrons for the coast defense?

Col. Squier. Indirectly; I have not segregated it as such. I would be glad to do so if you would like to have it.

Mr. Sherley. It is perhaps desirable that if moneys are to be appropriated for this purpose in the future they should come from this committee which technically only has jurisdiction.

Col. Squier. I should think it would be very proper.

Mr. Sherley. If an appropriation came in the Army bill worded in general language, a point of order would not lie against it, because there would be nothing that the House, in a parliamentary sense, could take notice of to indicate that it was intended for a purpose outside the jurisdiction of that committee; and, while I have not talked with the chairman of the committee, I have no doubt that a matter of that kind can be accommodated without friction. I would be glad if you would put in your notes what sum of the amount that you are now asking in the Army bill is intended for coast fortifications.

Col. Squier. Yes, sir.

Mr. Sherley. That is, for creation and equipment and accessories for these squadrons. Are you asking, also, a maintenance item?

Col. Squier. Yes, sir.

Mr. Sherley. Is that segregated?

Col. Squier. It is not separated as such.

Mr. Sherley. If it be practicable, I would be glad if you would also indicate what sum of money you would consider necessary as a maintenance item for the six squadrons that you are now creating and those that you are expecting to ask for, both as to continental United States, insular possessions, and Panama.

Col. Squier. Yes, sir. I may say that, as far as insular possessions are concerned, we hope during the present year, if we have good luck, to have a water squadron at Pnama, Hawaii, and the Philippines. They are all coast-defense matters.

COST OF MAINTENANCE.

Mr. Sherley. Colonel, you have spoken of the very great cost of maintenance in time of war, due primarily, I gather, to the very quick wearing out of the machines while in use?

Col. Squier. Yes, sir; as to the engines particularly.

Mr. Sherley. Now, in ordinary peace times, would the maintenance cost be considerably less than that?

Col. Squier. Yes, sir; somewhat less. We do not know just how much it would be, but it would depend on the service, of course, that they are in. We gauge it rather this way, to start with: When we put in a new squadron, wholly new, we buy at the rate of 3 machines for each man, making 36 machines to the squadron. Two of them are placed in the depot and the aviator begins to fly with 1. So we really have 3 machines for each man, because when a man is flying something may happen to his machine, and there is then a reserve of 2. In the matter of maintenance, in time of peace we are now counting on 2 machines per year. An engine is supposed to last about 300 hours, and it has to be overhauled every 30 or 40 hours complete before it is used again. We also have to provide 3 or 4 extra engines besides. The planes last longer than the engines.

Mr. SHERLEY. Is it your idea, after these squadrons are established, the men, of course, having been previously trained in the art at some aviation school, that they will engage in a certain amount of actual flying in a year as a matter of practice and drill?

Col. SQUIER. Do you mean the reserve officers?

Mr. SHERLEY. I had in mind, for instance, that if you had these six squadrons——

Col. SQUIER (interposing). If they were Regular Army people they would be flying right along throughout the whole year. They are doing that in the Philippine Islands now.

Mr. SHERLEY. And, in consequence, there would be considerable wearing out of the machines?

Col. SQUIER. Yes, sir.

Mr. SHERLEY. Do you figure that that maintenance will run pretty nearly to what it would be in war times?

Col. SQUIER. It would be slightly less. In war times they use four machines a year. They use them up rapidly and, besides, lose a large number of machines in combat. You can not tell anything about war.

Mr. SHERLEY. The reason I referred to that was because you were only giving the figures of what you thought the maintenance cost would be in time of war. You figured that the cost would be $800,000 to equip a squadron and that the maintenance cost would be $600,000.

Col. SQUIER. Yes, sir; that is the basis we are working on now.

Mr. SHERLEY. Now, with your squadron costing $800,000 for coast defense purposes, what do you figure—if you have figured it—that the cost of maintenance in time of peace would be?

Col. SQUIER. I have not the figures on that, but it is going to be far more than you would guess.

Mr. SHERLEY. Would it be one-half or two-thirds of that amount?

Col. SQUIER. If I was going to estimate it, I would estimate that it would be pretty nearly $600,000.

Mr. SHERLEY. Does that include pay of personnel?

Col. SQUIER. No, sir.

Mr. SHERLEY. That is simply the cost of the material?

Col. SQUIER. Yes, sir. The engines cost from $3,000 to $5,000 each. It is the most expensive military service and it is the most highly organized service. Just imagine, Mr. Sherley, that machine has got to be made so perfect as to go up into the sky, and you must have the absolute acme of engineering and technical skill, and this costs money. The airplane must be built to quality, not to price, which distinguishes it from the automobile industry.

SATURDAY, DECEMBER 16, 1916.

COST OF MACHINES.

Mr. SHERLEY. Col. Squier, yesterday when we adjourned we had gone somewhat into the question of cost of equipping and maintaining these squadrons of hydroplanes. There may have appeared in the record or have occurred informally a statement that there would be different types of flying machines according to the purpose for which they were to be used; and that for the purpose of "spotting" and in connection only with the fire control of the shore guns a slower, heavier type of machine would be used than machines expected to engage in general scouting work or in actual warfare. Would these slower machines cost the same amount that you have spoken of, approximately?

Col. SQUIER. I think perhaps I can answer that by taking a concrete example of what we are doing. I now hand you the specifications under which these machines are now being purchased for the coast defense. These specifications, which were issued on October 1, have recently been examined under the bids, and the following orders have been placed: Ninety-six machines are now ordered under this specification for the coast defense, of which 16 are to go to the Curtiss Co., at $22,500 each; 32 to the Standard Aeroplane Co., at $21,000 each; 32 to the Burgess Co., at $21,422 each; and 16 to the Aero Marine Co., at $18,000 each. This is for the machines alone, without any extra parts, with twin engines fully described in this specification. This specification also shows the usual type for Coast Artillery which you mentioned in your question, namely, for practical reconnoissance purposes in connection with the actual use of the guns in contradistinction to machines for strategical purposes. We have worked out a compromise in these specifications to produce the most useful type suitable to as wide a range of service for the Coast Artillery as possible consistent with the main object. For instance, these machines, as you will see, must have a minimum speed of 45 miles an hour on test, and must attain a maximum of 85 miles an hour. They must carry a useful load of 330 pounds of bombs of any sort that may be needed. They carry two men—a pilot and a trained observer. Two machine guns are provided for in each machine; you may or may not have them, as you wish. The machines are the tractor type, with the trained observer in front of the twin propellers and the pilot in the rear, giving a very good field of fire for both guns, front and rear. The type of gun provided for these machines at the present moment would be the Lewis gun or its equivalent, the same as we are now using in the squadron with the punitive expedition in Mexico. We are using British ammunition because we have not yet been able to get the other kind. However, we could use another gun, perhaps, equally as well. This gives you an all-around type of machine which, in the judgment of the technical board who formed this specification, after consulting all available sources of information, seemed to produce the most useful type. These machines you will see can serve as "spotting" machines for artillery practice and can drop their flares, which Gen. Weaver has mentioned, or display lights by which you can locate either a submarine, a torpedo boat, or a battleship, even behind a smoke screen or a fog bank, because with a horizontal range finder the height of the aeroplane is immaterial, and you can plot the exact position entirely independent of the height at which the light of the aeroplane is displayed.

SIGHTING TARGETS.

Mr. **Sherley**. Can an aeroplane flying at the speed you have indicated know when it is immediately above a target?

Col. **Squier**. Yes, sir; it is being done regularly in the European war.

Mr. **Sherley** (continuing). Accurately enough for plotting purposes in connection with the Coast Artillery.

Col. **Squier**. Yes, sir; the velocity of light signals or wireless is instantaneous, so that the speed of the airplane itself or the ship is practically negligible in comparison.

Mr. **Sherley**. What I had in mind was not so much the time involved in observing the signal of the aeroplane, but whether the observer moving at that rate of speed could accurately determine when he was immediately over the object.

Col. **Squier**. He can, sir.

Mr. **Sherley**. At what height?

Col. **Squier**. A mile or more. They never fly in land warfare much lower than a mile, and the fighting is becoming higher and higher all the time.

Mr. **Sherley**. What method has the observer, if he has any other than his eye, for determining that?

Col. **Squier**. There are certain sighting devices. It is a very simple arrangement for sighting objects in the distance or looking straight down over the side.

Mr. **Sherley**. Colonel, you were originally an Artillery officer?

Col. **Squier**. Yes, sir.

Mr. **Sherley**. So you are, of course, familiar with the methods they pursue in determining ranges?

Col. **Squier**. I used to be. I am not an expert now.

Mr. **Sherley**. But you are, of course, familiar with the fundamentals of it?

Col. **Squier**. Yes, sir.

Mr. **Sherley**. And you think it is perfectly practicable, from your knowledge of what is being done by observers in flying machines, to signal sufficiently often to enable plotting of the ship and the pre-ction of its course?

Col. **Squier**. I do, sir.

Mr. **Sherley**. And that would have special value in time of fog ank or of screen made by smoke?

Col. **Squier**. Yes, sir; because you do not need to know the position of the object. It is practically indirect fire, you see. It is the most curate method know of range finding now and used almost ex-usively in artillery work; in fact, there is no other method used.

Gen. **Weaver**. It would be very important and effective for deter-ining the range of the target under those special conditions.

Col. **Squier**. Yes, sir.

Mr. SHERLEY. It has been suggested, Colonel, that you explain just the plan that would need to be pursued in order to plot the course of a vessel so as to enable the shore batteries to predict its course.

Col. SQUIER. Practically the same plan that they follow now, except that the object you observe is either a light or a signal vertically above the target, the position of which is plotted graphically on the plotting board.

Mr. SHERLEY. In other words, you would do it on the same principle of triangulation of taking the angles——

Col. SQUIER (interposing). You have to have a horizontal base, of course. A vertical base would not do. You have a visible signal displayed, and you plot its position on the board, and then you know the rate of progress, and you can predict ahead the same as you do now.

Gen. WEAVER. Would not that depend on the aeroplane moving at the same rate as the ship on the water?

Col. SQUIER. Yes; only if the——

Gen. WEAVER (interposing). And if it was moving at a different rate—suppose the ship was moving at 10 knots an hour and the minimum speed of your airplane was 45 miles an hour, I do not see how you are going to use it for prediction purposes. I can see how you might locate it just for one instant and obtain the position of the target behind the screen, which would be very valuable; but I do not see how you are going to follow out the prediction method with a plane that is moving 45 miles an hour and a ship that is moving only 10 knots.

Col. SQUIER. This is the way they do that, sir. They run at the slowest speed possible, as you know, for "spotting"—in this particular instance 45 miles an hour—and they hover and circle about and follow it along in this way [indicating]. They simply spiral over the object and give the signal only when directly over the target.

Mr. SHERLEY. Then, the only movement that would be involved would be the movement of the ship, and the speed of the airplane would be a negligible factor?

Col. SQUIER. Yes, sir. He does not give you a signal except when he is directly over it, but he is spiraling above the target all the time.

Gen. WEAVER. In order to use the prediction method with a uniform interval of time, you would have to eliminate that?

Col. SQUIER. Yes; but you do not need that, General.

Gen. WEAVER. I wanted to clear up that point.

Col. SQUIER. It does not require uniform time intervals, and that is the way they do it now.

Mr. SHERLEY. You could, of course, take the time intervals of the different flashes and then, having the location as indicated by the flash, it would still simply be a matter of prediction, with a little different formula?

Col. SQUIER. Of course, on land, when you can see the target itself, you simply take observations at regular intervals, which are all alike, but you do not need this, as you can very accurately predict without it.

Gen. WEAVER. Our whole prediction method depends upon assuming that the motion of the target we are firing at is uniform throughout an interval of time of 30 seconds, and so we have our time-interval bells that give us our 30-second observations. We could make a modification in that, of course.

Col. **Squier.** Of course you could.

Gen. **Weaver.** We could make a modification so as to make an observation every time the aviator shows his light.

Col. **Squier.** Yes, sir.

Gen. **Weaver.** If the signals were not on 30-second intervals we could make corrections for the differences.

Col. **Squier.** It is quite an easy problem. There is one other way they are doing it, Mr. Sherley, which is rather a new idea. They take an ordinary small dirigible gas bag—not a large, unwieldy thing—and they take a standard airplane and take the wings off and suspend it as the car of the dirigible, then with its engine and propellers drive it along, so that you can suspend yourself and stay perfectly still at any given level.

Mr. **Sherley.** Do you mean that you use a balloon arrangement for lifting purposes?

Col. **Squier.** Yes; to hold it level and then drive it along as you please with the airplane. That is a very useful type and is very recent. The engine drives it along and then you can put wings on it and drive it just as an airplane if you wish. We are planning to try out some of these.

Mr. **Sherley.** The advantage of that would be that you can remain suspended over a given point if necessary?

Col. **Squier.** Yes, sir; and give the predictions, which will be very useful, indeed. In fact, they are using them at Saloniki and elsewhere. They have a number of these in the British service. It is a combination of the lighter-than-air and the heavier-than-air machine.

Mr. **Sherley.** Colonel, you have spoken of having ordered 96 of these machines; that would make 6 squadrons?

Col. **Squier.** Yes; I told you yesterday that the ideal unit comprised 36 machines, 3 for each man, and 12 men to the squadron. We have only provided for 16 machines at the present time because we want to profit by all the experience we can get, and it is in our project for next year to complete that equipment for these six squadrons, instead of buying the whole 36 for each of them now. It seemed good wisdom and good judgment to buy 16 and have only 4 in reserve.

Mr. **Sherley.** Let me see if I quite understand you. I have had to carry these figures in my head. You have ordered 96 flying machines of this slow type that you have spoken of?

Col. **Squier.** Yes; slow and fast—85 miles an hour is the maximum.

Mr. **Sherley.** Of this heavier type?

Col. **Squier.** Yes, sir; with twin engines.

Mr. **Sherley.** And you are contemplating, with the appropriations you already have or with the appropriations you are asking, to get the equipment for six of them?

Col. **Squier.** With the appropriation of this present year we have actually bought 96, and I presume that is all we will buy of the marine type this year. With the 96, as I told you yesterday, we will hope to form six squadrons for the Continental United States, giving them, naturally, 16 machines each. I told you yesterday that the ideal final equipment of a squadron was three machines for each pilot, so you will see we are only providing for four reserve machines for each squadron.

Mr. Sherley. If I understand you, then, you are supplying now 16 machines for each squadron, whereas the full allotment for war purposes contemplates 36 machines, or a reserve of 2 machines for each flier, there being 12 fliers in a squadron?

Col. Squier. Yes, sir.

Mr. Sherley. Now, Colonel, is not that more machines than is necessary in the way of ordinary use in peace times at fortifications?

Col. Squier. Not in my judgment; no, sir.

Mr. Sherley. Why not?

Col. Squier. It is only a start, in my judgment. I do not think we know just where this leads to, but I think that is very conservative, indeed.

Mr. Sherley. You are figuring, as I recall, on four squadrons for the Atlantic side and two for the Pacific side?

Col. Squier. Yes, sir.

Mr. Sherley. By the Atlantic do you also include the Gulf?

Col. Squier. Yes, sir; if Gen. Weaver wishes to put some of them there.

Mr. Sherley. Gen. Weaver, how many fortifications are there on the Atlantic and Gulf sides?

Gen. Weaver. Twenty-two existing coast defenses.

Mr. Sherley. That would give you, according to your present plan, 64 machines for the Atlantic, and, according to your arrangement, 48 with fliers and 16 reserve machines?

Col. Squier. Yes, sir.

Mr. Sherley. That would give at least two for each one of these fortifications?

Col. Squier. Yes, sir.

Mr. Sherley. And you do not think one would be sufficient?

Col. Squier. Mr. Sherley, I think the whole four squadrons would be about right for New York alone in war time.

Mr. Sherley. Of course, I was speaking, not of war conditions and what you might have in the way of reserves and of trained personnel, but what you would desire to use throughout the year.

MAINTENANCE OF MACHINES.

Colonel, in order to simplify the matter a little bit can you state about what it costs the Government to maintain a machine in the air for a year?

Col. Squier. $50,000, approximately.

Mr. Sherley. On that basis, having 48 machines in the air for the Atlantic and the Gulf, it would show a yearly cost of $2,400,000?

Col. Squier. Yes, sir.

Mr. Sherley. And inasmuch as you are supplying half of that number for the Pacific it would mean $1,2000,000 for the Pacific or a total of $3,600,000?

Col. Squier. Quite right, sir.

Mr. Sherley. That is to be the maintenance cost?

Col. Squier. Yes, sir.

Mr. Sherley. And would be exclusive of the cost of supplying the accessories to the machines in the first instance?

Col. Squier. Yes, sir.

Mr. Sherley. Have you figured out what it is going to cost, including everything except, of course, land, quarters, and matters of that kind—everything directly relating to the machines, including their maintenance for a year?

Col. Squier. Yes, sir; I think I have it, approximately. After you asked me yesterday to look at it from your angle of view I took the analysis and segregated the figures as you requested. I am not sure that I have it just as you want it, but here is a statement which I think will show what is wanted.

Mr. Sherley. Colonel, we will put this statement in the record.

(Said statement follows:)

TENTATIVE COAST-DEFENSE PROJECT, 1917.

AERO SQUADRONS.

The following coast-defense squadrons are planned to be organized by June 30, 1917, and their tentative assignment to stations, subject to the approval of the Secretary of War:

Regular Army: One coast-defense squadron (Philippine Islands), one coast-defense squadron (Hawaiian Islands), one coast-defense squadron (Canal Zone).

Reserve Corps: Two coast-defense squadrons (New York), one coast-defense squadron (Boston), one coast-defense squadron (Chesapeake Bay), one coast-defense squadron (Puget Sound), one coast-defense squadron (San Francisco).

Total coast-defense squadrons, nine.

Estimated expenditures for 1917, for hydroplanes only.

Philippine Islands (1 squadron)	$200,000
Hawaiian Islands (1 squadron)	400,000
Canal Zone (1 squadron)	400,000
Continental United States (6 squadrons)	1,000,000
Total, 9 coast-defense squadrons	2,000,000

As regards the 1917 project, it is planned that all coast-defense squadrons will be organized and partly equipped by June 30, 1917.

They will not have their full complement of aeroplanes, however, until after June 30, 1917; this on account of the inability of manufacturers to furnish aeroplanes before June 30, 1917.

Coast-defense project, fiscal year ending June 30, 1918.

(1) Maintenance, 1 squadron (Philippine Islands)	$600,000
(2) Maintenance, 1 squadron (Hawaiian Islands)	600,000
(3) Maintenance, 1 squadron (Canal Zone)	600,000
(4) Completion and maintenance, 6 reserve squadrons (continental United States	3,600,000
(5) Organize and maintain 1 new squadron, coast defense, eastern coast, United States	800,000
(6) Organize and maintain 1 new squadron, coast defense, western coast, United States	800,000
Total cost coast-defense project, 1918	7,000,000

Project for fiscal year ending June 30, 1918, including both coast and inland defenses.

(1) Completion and maintenance of 9 coast-defense squadrons	$5,400,000
(2) Organize 2 new coast-defense squadrons	1,600,000
(3) Maintenance 4 land squadrons	2,400,000
(4) Organize 2 land squadrons	1,600,000

(5) Aviation school, San Diego	$600,000
(6) Aviation school, eastern United States	1,200,000
(7) Aviation school, central United States	1,200,000
(8) Experimental station	600,000
(9) Lighter than air	1,000,000
	15,600,000

The expenditures noted herein for the project do not include any expenditures for (*a*) the purchase of land; (*b*) the improvement of land; (*c*) the erection of buildings for barracks, quarters, hangars, shops, and numerous other technical buildings; (*d*) the pay of personnel.

The efficient development of aviation and its effective administration will require the purchase and improvement of land and the erection of buildings, etc.

Col. SQUIER. I would like to say something with reference to the value of a statement of this kind made a year in advance. Of course, buying hydroairplanes is not like buying Army wagons, etc., as you understand, and, therefore, I wish it distinctly understood that these are general figures relating to an industry that is now in its infancy, and to illustrate that, I find only this morning that the Curtiss Co. has requested 70 days' extension of the time in which they promised to fulfill the order given them, which indicates the flexibility that we are laboring under on these orders. We wo not know where we stand in this industry, but we are using every known agency to build it up in this country.

Mr. SHERLEY. The statement that has just been put into the record shows that the estimated expenditures for the fiscal year 1917 for hydroplanes only are $200,000 for the Philippine, Islands, one squadron; $400,000 for the Hawaiian Islands, one squadron; $400,000 for the Canal Zone, one squadron; and six squadrons for the continental United States, $1,000,000, the total for nine coast-defense squadrons being $2,000,000. Now, it appears that for the squadran in the Philippines the expenditure is $200,000 as against $400,000 for a squadron in the Hawaiian Islands and the Canal Zone. I presume that is due to the fact that you already have some equipment in the Philippine Islands?

Col. SQUIER. Yes; one company is over there now, one-third of a squadron.

Mr. SHERLEY. One-third of a squadron is there now?

Col. SQUIER. Yes.

Mr. SHERLEY. Why is the cost reduced to half?

Col. SQUIER. Because we have already bought the expensive sea sled, for instance, which cost $23,000, and because we have a lot of accessories already on hand—traveling machine shops, and all sorts of things.

Mr. SHERLEY. The statement, then, that these estimated expenditures for 1917 are for hydroplanes only is not to be taken absolutely literally? You contemplate with this sum of $2,000,000 to get something more than the hydroplanes?

Col. SQUIER. Yes, sir. There are four machines, one company, out there now and we hope to complete that squadron, and we have estimated that $200,000 will furnish the airplanes necessary. Of course, the Hawaiian Islands, which has nothing at all, will take twice that amount.

Mr. SHERLEY. These statements are approximate only, as I understand, Colonel?

Col. SQUIER. Yes, sir.

Mr. SHERLEY. Your program, then, contemplates the expenditure, in addition to what has already been expended in equipping the company that is now in the Philippines, of $2,000,000 for 1917?

Col. SQUIER. Yes, sir.

Mr. SHERLEY. In connection with the coast defense?

Col. SQUIER. Yes, sir; they are already contracted for, and the exact amount is $2,007,000. This is the fact and not the theory.

Mr. SHERLEY. What other expenditure do you contemplate making in connection with these nine coast-defense squadrons out of moneys already appropriated for the fiscal year 1917?

AERONAUTICAL GROUNDS.

Col. SQUIER. I am glad you brought that up, Mr. Sherley, because these are just for the machines, and there are any number of things that have to go with them. If I may be allowed I would like to say that the real thing that is delaying us at this moment is not that we have not placed orders for machines, because we have, as I have shown, and not that we have no personnel, which I can also show you if you wish; but the fact that at this moment we have not a foot of ground that we can go to as a home and settle down, so to speak, and no place to which deliveries can be made of these $2,000,000 worth of machines which will be due, we hope, in March, May, and June. We will have to provide some place to test them and take them to in the interim, and to that end we expect, if it has not already been done, that authority will be asked, probably of this committee or of the Military Committee of the House, I do not know which, to allow us to use a portion of the $13,281,666 now available for aeronautics for the purchase of land and the improvement of grounds for areonautical purposes.

Mr. SHERLEY. Have you any particular locality in view, and if you have what is the estimate as to the cost of buying it and so equipping it?

Col. SQUIER. It is not a question, in general, of a particular locality, but it is a question of providing adequate aeronautical grounds, geographically distributed, for the disposition of the land and water squadrons which I have outlined to you, sir. The only particular locality for a certain specific and particular use which has been determined upon, and which was specifically authorized in the existing law, is for a proving ground which corresponds to Sandy Hook and Indianhead, and a special site for the main Regular Army flying school which corresponds to West Point, in the Army air service. These two specific sites are provided for in the existing Army appropriation bill, and a site for a proving ground has been accepted and determined upon, and its purchase has been authorized by the Secretary of War.

Mr. SHERLEY. Where is that?

Col. SQUIER. About two and a half miles from Hampton, Va.

Mr. SHERLEY. Am I to conclude from what you have said that you desire to get ground in connection with each of these squadrons, or am I right in the conclusion that these squadrons will be taken care of at the fortifications that they serve?

Col. SQUIER. The answer to the latter part of the question is that they can not be taken care of at the fortifications except, perhaps, one or two air planes, detached for special service.

Mr. SHERLEY. Then what you want is to have some one or more places for the squadrons assigned to the Atlantic and for the squadrons assigned to the Pacific, and for the squadrons in the Philippine Islands, the Hawaiian Islands, and Panama?

Col. SQUIER. And also for a chain of landing stations along the Mexican border, perhaps first of all.

Mr. SHERLEY. But there you are getting away from fortifications. I am trying to confine the hearings to the fortification side of it.

Col. SQUIER. Yes, sir; you are quite right, sir.

Mr. SHERLEY. Have you any estimate either as to the quantity of land desired or the cost of it, and where you wish it?

Col. SQUIER. I have not segregated that estimate from the standpoint of coast defense alone, but can do so, as I have done here, if you so desire.

Mr. SHERLEY. We would be glad to have you do so, but until you have done it can you now state what you estimate the cost is of all of the projects for the procurement of land and equipment.

Col. SQUIER. I think I can illustrate the difficulty in making such an estimate by our actual experience. We have at the moment sections of land on Long Island, at Mineola, for instance; another district near the city of Philadelphia, 4 miles from League Island, Essington; another station at Miami, Fla.; and a square mile in the suburbs of Chicago. These particular places we are now using under various forms of donations, gifts, and so on. In some places we pay $1 per year. In other words, the municipalities have been very willing and generous, naturally, to offer the Government various propositions all over the country, and a considerable amount of our time is involved in handling land problems all over the country. So that the question of suitable strategical and tactical flying grounds, not only for the coast defense but for an adequate air service for the whole country, should be taken up immediately, for the reasons I have pointed out, comprehensively and carefully, and to that end, since this is a very pressing matter, I have suggested that a sum not to exceed $3,000,000 of the present appropriation be made available for the rental, purchase, and improvement of such sites, and in the coming fiscal year a provision to that effect is also included.

Mr. SHERLEY. While you are unable to indicate the localities and, therefore, the costs, either of rental or of purchase, can you a little bit more in detail indicate just what is in contemplation, not as a temporary expedient but as a permanent program for the squadrons in connection with the coast fortifications? A moment ago you spoke of it as being possible to take care of a flying machine at fortifications and impliedly that that was the limit of their power.

Col. SQUIER. Perhaps two or three.

Mr. SHERLEY. Is it your idea that there shall be one or more large stations on the Atlantic and the Gulf, we will say, for these four squadrons intended for the Atlantic and the Gulf, and that then there shall be at each fortification one of the flying machines that will operate from that place, or is it your idea that all of these flying machines, composing the four squadrons, will operate from these central bases?

Col. **Squier.** Both of your suggestions, I believe, will work out in practice. Each squadron will have its central flying place, a home or place where it gets its extra personnel and material. For instance, in New York the east end of Long Island might be the natural place where you would want that particular squadron to go and report. In Boston is the flying field at Squantam, which I looked over recently. That would seem to be a suitable place for a squadron to help defend the whole harbor of Boston. That place struck me favorably, and if the State of Massachusetts, in conjunction with the Federal Government, or the Federal Government alone, could make it possible to acquire that land for all time as a home base for the air squadron it would result in an additional defense of the city of Boston. That would undoubtedly be a wise step and one that should be taken immediately. If that action were taken the squadron at Boston would naturally be stationed there.

Mr. **Sherley.** What I am trying to get at is not only an idea of what is involved in land purchases, but what would follow from that; and, assuming that the personnel manning these machines intended for coast-defense purposes should come from the Coast Artillery, to what extent they would be at the fortifications and subject to the control and direction of the commanders?

Col. **Squier.** Do you mean the individual post commander or the commander of a group of defenses?

Mr. **Sherley.** Let me concretely illustrate: We are putting up defenses at Cape Henry. It will be some years, I fear, before they are there, but they are being very largely appropriated for. There will be a number of forts there, at least, there will be a number of primary guns, mortars, and secondary batteries. There will be an officer in charge of all of the defenses at Cape Henry, and I would like to know whether the machines intended to be used in connection with that fortification will be expected to stay at that fortification and be directly under the control of the commanding Artillery officer of that fortification or will they have their home port, if I may use such a word, at one of these centrally located bases and simply come to that fortification for their work?

Col. **Squier.** I see your point. Undoubtedly, Mr. Sherley, the whole air force, of whatever nature, would be under the supreme commander, just as the air force with the punitive expedition under Gen. Pershing is under his command. He does whatever he pleases with his air planes. I have no control over them at all, and, incidentally, he chooses to carry the official mail every day in 60 minutes from his headquarters to the border.

So that whatever force is sent to defend Chesapeake Bay that we are planning for, will be turned over to the defense commander there to use as he and his staff may decide.

Mr. **Sherley.** Do not let us misunderstand each other. I am trying all the time to differentiate between the air service in a general sense and the air service as particularly tied to a given fortification in connection with fire control.

Col. **Squier.** In reply to that I will say that each individual fort would apply for and have assigned to it certain definite specific aeroplanes to go to that post and offer any service that the commander needs or prescribes in connection with the particular sector of fire which he controls.

Mr. SHERLEY. Would they have their home there, or would they only go there when required?

Col. SQUIER. A little of both. Normally they would probably belong to some central squadron for administrative purposes, and they might be perhaps 50 or 100 miles away, but 50 miles is nothing in this business. At this very moment there is an airplane stationed at Fort Myer, Va., for instance. Each particular fort could have three or four airplanes coming to it on detached service, to be relieved from time to time by other airplanes from the home squadron.

HOUSING STATIONS.

Mr. SHERLEY. What I am trying to get at, with perhaps more detail, is whether you would have to make an arrangement—in order to use the illustration that I have made—whether you would have to make an arrangement at Cape Henry for the housing of one or more airplanes.

Col. SQUIER. Yes, sir.

Mr. SHERLEY. And for various accessories?

Col. SQUIER. Yes, sir; you would have to do that at every station.

Mr. SHERLEY. So that airplanes, or those airplanes, would live there as long as they were assigned to that post?

Col. SQUIER. That is quite right.

Mr. SHERLEY. Or do you have in contemplation that they would always home at the central station, and then simply report daily to those particular fortifications?

Col. SQUIER. No, sir; I think they would live there. Some airplanes would always be on detached service at a fortification.

Mr. SHERLEY. Assuming that two or three airplanes were to be at the Cape Henry fortifications, your idea contemplates provisions on that reservation for taking care of those two or three machines, and, while the particular personnel and machines might change, there would be constantly housed there two or three machines with their personnel and accessories?

Col. SQUIER. Yes, sir.

Mr. SHERLEY. Now, have you had made any inquiry into the extent of the reservations of the existing fortifications and those that are in process of completion, for the purpose of determining what, if any, available space for that purpose exists at those fortifications?

Col. SQUIER. We have not formally reached that stage of development, Mr. Chairman.

Mr. SHERLEY. Have you come to a conclusion as to what ground is necessary for the housing, in the sense we are now talking about, at particular fortifications, of one machine or two machines, as the case might be?

Col. SQUIER. Do you mean the dimensions of the ground?

Mr. SHERLEY. Yes; I mean how much area. These are all to be hydroairplanes and, presumably, they have to alight on the water and rise from the water.

Col. SQUIER. Suitable beach is what you want.

Mr. SHERLEY. Of course, at every fortification you would have water.

Col. SQUIER. You do not need very much beach for two or three airplanes; a few rods would do.

Mr. SHERLEY. Would it not rather follow, then, that there would be sufficient space at each fortification for the purpose we have been talking about?

Col. SQUIER. Yes, sir.

AIRPLANES FOR COAST DEFENSES.

Mr. SHERLEY. Colonel, this statement shows that your coast defense project for the fiscal year 1918 contemplates for the maintenance of a squadron in the Philippine Islands, $600,000, a squadron in the Hawaiian Islands, $600,000, a squadron in the Canal Zone, $600,000; completion and maintenance of the six reserve squadrons in continental United States, $3,600,000; the organization and maintenance of a new squadron for coast defense of the eastern coast of the United States, $800,000, and to organize and maintain a new squadron for the coast defense of the western coast of the United States, $800,000, or a total coast-defense project for the fiscal year 1918 of $7,000,000?

Col. SQUIER. Yes, sir.

Mr. SHERLEY. Do you recall the estimate that has been submitted to the Military Affairs Committee for the fiscal year 1918?

Col. SQUIER. $15,600,000.

Mr. SHERLEY. And that embraces this $7,000,000?

Col. SQUIER. Yes, sir.

Mr. SHERLEY. So that in the event this committee should deal with the estimate for the fiscal year ending June 30, 1918, as it relates to coast defense, you should want to decrease your estimate in the Army appropriation bill to the extent of $7,000,000, and have submitted to this committee an estimate of that amount of money?

Col. SQUIER. Yes, sir; that is, if the coast defense part of the appropriation is separated and sent to this committee, it would amount to $7,000,000.

Mr. SHERLEY. And to that extent the estimate before the other committee could be reduced?

Col. SQUIER. Yes, sir.

Mr. SHERLEY. Colonel, would it not be practicable, and perhaps desirable, assuming that this committee should exercise its unquestioned jurisdiction touching this subject as it relates to coast defense, for provision to be made in the bill for an investigation, examination and report touching the land areas in existing coast fortifications which would be available for the use of such flying machines and their personnel as might be assigned for work local to the particular fortification?

Col. SQUIER. Highly desirable, Mr. Sherley.

Mr. SHERLEY. And if I have understood your testimony heretofore, what you think is pressing and desirable now is that authority should be given by Congress to expend not exceeding $3,000,000 of appropriations heretofore made in the purchase or rental such land and the equipment of it as may be necessary for the establishment at this time of central stations for airplane squadrons.

Col. SQUIER. Yes, sir; for schools, squadrons, and posts.

Mr. SHERLEY. And this is aside, as I understand you, from the question of obtaining suitable housing space and facilities at the respective fortifications?

Col. SQUIER. Absolutely separate from that; yes.

MOBILE FORCES.

Mr. SHERLEY. Colonel, I presume the most pressing thing, among the very pressing things that have come to you in connection with organizing this new defense, has been in connection with the use of airplanes with the mobile army?

Col. SQUIER. Yes, sir; we regard our mobile forces in the light of being in the presence of the enemy, in a way, and their needs take precedence over everything else, and has from the beginning.

Mr. SHERLEY. So that beyond the ordering of these machines to form six squadrons for the United States and the little work that has been done in connection with a company in the Philippines and the submission of these broad estimates for next year, there has been no detail work done in connection with the development of the airplane in connection with coast defenses?

Col. SQUIER. No, sir; but we have studied the subject, as this specification evidences. We have contracted for the machines, which is a start, but our most urgent need has been to attend to the border troops at all costs.

Mr. SHERLEY. Assuming Congress appropriated this $7,000,000, you would be in position to expend it during the fiscal year 1918, irrespective of the determination touching the land and equipment that might be necessary at each fortification?

Col. SQUIER. Yes, sir.

Mr. SHERLEY. Some of the maintenance cost, of course, would be the maintenance of these flying machines at each fortification?

Col. SQUIER. Yes, sir.

Mr. SHERLEY. What would be your idea as to how you would handle that?

Col. SQUIER. We would keep a small amount of equipment with the detached machines, and they would have their home base to fly to in case of real trouble; but small repairs would be made at the fortifications.

Mr. SHERLEY. In other words, you could, in all probability, take advantage of facilities that unquestionably exist at the fortifications for the incidental repairs to machines; and by the expenditure of a limited amount of money you could house them temporarily until this matter was finally determined.

Col. SQUIER. Yes, sir.

Gen. WEAVER. Would not your policy be the same as the policy for other Signal Corp property now in the hands of the Coast Artillery: that is, in certain cases the repairs are made there, and in other cases property has to be sent to the depots for repairs?

Col. SQUIER. Just exactly that. There is always the main base where the machines may return for complete overhauling or extensive repairs.

Mr. SHERLEY. This estimate for 1918 contemplates completion and maintenance of six reserve squadrons. By "completion" you do not mean the purchase of additional flying machines, but simply the completion of the supplying of accessories for the 96 machines you have already maintained?

Col. SQUIER. You will remember that I told you that for the six reserve squadrons which we have bought, we did not buy their full equipment. Naturally we will go on during the next year and complete the equipment.

Mr. **Sherley**. But that did not contemplate more than 96 machines out of moneys appropriated next year for the continental United States in connection with the coast defenses.

Col. **Squier**. We have already contracted for 16 machines for each squadron, and presumably we will go on and buy each of them more machines to complete their normal equipment, and so I state "completion and maintenance," because next year completion will include largely maintenance and after the third year it will be all maintenance.

Mr. **Sherley**. And these squadrons for which you have figured a maintenance item, you have contemplated they would be fully created out of expenditures which it is estimated you will make from funds available for the fiscal year 1917?

Col. **Squier**. Yes, sir; as far as we can determine.

Mr. **Sherley**. Of course, in one sense the squadrons for the insular possessions and the Canal Zone are further behind than those for continental United States, because, with the exception of one company in the Philippines, you have not yet obtained even the machines.

Col. **Squier**. No; we have not had any money to do so, but we shall push the ones for the Panama Canal Zone and Hawaii as soon as we can.

Mr. **Sherley**. You say you have not had the money. I suppose what you mean by that is you did not feel heretofore like taking the money out of the thirteen and odd million dollars; but you do estimate that you will take $2,000,000 of that fund in order to create these squadrons.

Col. **Squier**. I think you misunderstood me. I meant we had not the money before this year. Last year we had only $300,000 altogether. Now we have plenty of money for our needs and can go right ahead. There has been no holding back on account of a lack of money this year, but in previous years it would have been totally out of the question to do anything of that sort. You realize that an estimate of this sort, as I have said before, is of course simply an estimate, and that is all it is. Anything could happen that would change these things very materially, because none of us know just how fast this development will take place.

Mr. **Sherley**. Now, Colonel, perhaps it might be well, in view of the considerable sum that was last year appropriated and the considerable sum that Congress is being asked to appropriate this year, that you make some statement, a little fuller, perhaps, than can be gathered from what you have heretofore testified, touching what you consider to be the necessary development and evolution of this new weapon of offense and defense.

Col. **Squier**. The navigation of the air is literally a world movement and no individual, association, or set of men can, even if they so desired, materially impede its progress.

Mr. **Sherley**. It has assumed a dominating position in the European war?

Col. **Squier**. Yes, sir; the side which controls the air has literally insuperable advantage over his adversary.

IMPORTANCE OF AIRPLAINS.

Mr. **Sherley.** In order that those of us who are new to the subject and have had no object lessons in its development in the European war may get some slight conception of its magnitude, can you tell us somewhat more in detail the extent to which aeroplanes are being used in the war and how great a factor they are in determining results of battles and in becoming the agency through which inadmissible damage is done to an enemy?

Col. **Squier.** At the outbreak of the present war, in 1914, England had just started an air service. France had a considerable number of airplanes on paper, but these airplanes had been developed from a sport standpoint, largely, and when the war broke out were found to be totally unsuited for military use. The motif in France had been the individual man or factory and not standardization for military service. As a result they had developed certain sport types of machines but no standard form of control and they required very carefully prepared grounds to operate from; in other words, they were totally unsuited for military service. In a way, then, France had to start all over again and build to quality and adaptability for military service.

Especially from the military standpoint airplanes should be built, first of all, to quality and not to price. Airplanes demand the best of everything, including personnel as well as matériel. In the French Army and in the British Army to-day the flyers are accorded privileges and comforts unknown to any other branch. In the beginning the aircraft was used particularly for reconnoisance purposes, and as the war progressed this branch, in all of the belligerent countries, went forward by leaps and bounds. It is impossible to appreciate what can be done under the stimulus of war when everything in the country, civil and military, is mobilized for one single object, without regard to expense. As a result the airplane has reached such a stage now that there are literally dozens of types, practically catalogued in certain cases, ranging from the high-speed single seater at 150 miles, built with a steel fusilage, down to the slow machine of large dimensions, for weight carrying, and engine power up to 800 and 1,000 horsepower. Between these limits we can see intermediate types possessing various characteristics, such as climbing power, speed, weight-carrying, fighting types, etc. The extent to which airplanes are manufactured and used in the present war even at the moment is, of course, difficult to obtain in exact numbers.

The machines are manufactured in two ways; that is, by the Government and by private manufacturers, if such a distinction can be made when everything is really under the Government. There is a central Government factory. Airplanes are now produced on the quantity basis. The types are standardized and made in quantity. The different parts are put in bins and assembled on a production basis. Special machines are devised for streamlining, struts, wires, etc., and the highest possible engineering talent and skill has been brought to bear and focused on this subject, until the airplane to-day represents probably the highest achievement of engineering skill of any machine, and that is true of both the engine and the design of the plane. Its every particular is worked out with extreme care, and the slightest, apparently unimportant, changes, when worked out properly, make great improvements in the performance of these machines. The national advisory committee for aeronautics in England, headed by Lord Rayleigh, the leading physicist of the world, comprises such men as Glazebrook, who corresponds to Dr. Stratton of the Bureau of Standards; Lanchester, who is one of the leading engineers in England; and Horace Darwin, and others, with a corps of the best brains in England to assist. They have all taken hold, in a national way, of this problem and have been largely responsible for the solid basis on which this engineering problem has now been placed. We have a similar committee in this country—the national advisory committee for aeronautics—which is about two years old. This advisory committee has been of great assistance to the aviation section of the Signal Corps.

In regard to the future of the airplane, no man is wise enough to foretell what these machines may accomplish, even a year hence. We have been, in fact, passing our lives on the bottom of a deep ocean, and this ocean is composed of a comparatively heavy fluid. For instance, the air in a small room, 18 feet by 20 feet by 10 feet, namely, 3,600 cubic feet, if converted into liquid or solid form, which could be done at the Bureau of Standards, would weigh practically 300 pounds, and in such form could be removed from that room, with difficulty, by a strong man. This indicates the comparative mass of this fluid which we do not notice because we have pressure on all sides of us. That easily explains, in a very general way, why it is that we can fly in it by the dynamic reaction of this mass against the propellers of machines. We have comparatively recently learned how to construct machines to move about in three dimensions in this ocean, and it is a universal medium covering all the earth, and we can move from any point on land and water to any other point in a direct line. As a means of transportation it is unique in some particulars. There is no right of way to purchase; there is no annual upkeep of track or roadbed, as in the case of trains and automobiles; there are no tunnels to build, no mountains to be crossed, or bridges over rivers to be constructed. All of the money is in the rolling stock or transportation car, and it would appear that when these machines are placed on a production basis the price should be so reduced as to make this new method of transportation, at least for certain restricted uses, such as the mail and a certain amount of passenger service, an easy competitor of the older forms of transportation.

And on this view we must, at least to begin with, think of our interior cities, such as Indianapolis, Louisville, etc., as literally airport towns, with the ultimate necessity for adequate provisions for the air tonnage that will, it is believed, arrive and depart from these ports. As a first instance of the commercial use of the airplane, in distinction from its military uses, will be that of carrying the mails. This will be one of the very first commercial uses made of airplanes. In fact, mail is now carried from the headquarters of the punitive expedition in Mexico to the American border in airplanes of the first squadron on duty with that expedition. The distance is approximately 110 miles and the time is approximately 66 minutes. Time is evidently a great element with the mail as well as expense, because time is money, and I see no reason why the Post Office Department may not easily be as large a purchaser, if not a larger one as far as numbers are concerned, than, perhaps, both the Army and the Navy combined. I believe the Post Office Department should immediately estimate for and inaugurate, on certain selected aerial routes, a mail service, not in difficult parts of the country, such as Alaska, but in the easiest parts of the country, in order to demonstrate the reliability of this service. It seems desirable to begin the easiest things first rather than the most difficult things.

I believe that such a service should be inaugurated at once. In handling the mail the shore line between land and water, which, from many angles of view, is now considered an advantage, in the new air service, perhaps, may be considered a disadvantage, and certainly interior towns not far removed have certain advantages over the coastal towns, because there is land all around and there is the absence of the two elements with the town on the edge. The mail can be taken from ships at sea two or three hundred miles out and proceed immediately inland, avoiding the consequent delays upon landing, such as quarantine, dockage, etc. The mail for the State Department at Washington could be easily taken from ships two or three hundred miles out at sea and delivered directly at Washington, and the Army to-day can transport by airplane a bag of mail from the State Department to Governors Island and put it aboard the *St. Paul*, for instance, quicker than by any other known agency. In other words, gentlemen, the air service is absolutely a world-wide movement. Whereas from a military standpoint the great armies in Europe will disband after the close of the war, it is believed that the gain made in the development of air service will not shrink, but will be utilized and go forward in the arts of peace as well as war. The advent of the period when we can live in three dimensions instead of two brings with it fundamental changes second to none in the history of the development of civilization.

Mr. SHERLEY. Colonel, what you have said is extremely interesting and opens up a very large vista; but I think the committee would be glad if you would a little bit elaborate what is now being done in a military way in connection with flying machines. You spoke of the fact that in the beginning they were used for reconnoitering, but since then I presume their use has gone into many additional fields?

Col. SQUIER. Yes, sir.

Mr. SHERLEY. Will you indicate those additional fields?

Col. SQUIER. In the beginning, as I said before, the principal use of the airplane was for reconnoissance purposes, both tactically and strategically, and the airplane as an instrument of offense was, in the very early stages of the war, little used. It was, however, the service par excellence for observing and obtaining information, both tactical and strategical, and immediately took a commanding position at the expense of the Cavalry, which heretofore had been the arm that rendered that service. In other words, we can regard, with a bit of imagination, the tactical aviator as a sort of glorified cavalryman mounted on a mechanical horse who goes forward alone or in squadrons to perform a more or less similar service to that previously performed by the Cavalry arm. As the air forces have developed, the aero battle has followed as a matter of course, which has led to the arming of aeroplanes for offensive work.

ARMAMENT FOR AIRPLANES.

Col. **Squier.** The question of armament for airplanes is looked at in Europe something like this: The measure of fighting value of an airplane might be taken much as we do that of a ship. The energy of the broadside of a ship classifies it. With certain modifications, that energy might be taken as the measure of the fighting value of an airplane, except that it would not be limited to a plane, but it can shoot upward as well as downward. Assuming, then, that that is so, the question is should that energy be distributed in a small number of large projectiles or in a large number of small projectiles. Evidently, as an extreme case, in an aerial battle, with one airplane fighting against another airplane, if we had all of our ammunition in one shot of a large gun, and if we missed the enemy airplane with that one shot, our chances of injuring him would be nil. If, on the other hand, we had a machine gun with a large number of projectiles, we could in passing the enemy airplane at high speed rain upon him more or less continuously a stream of lead projectiles, any one of which would do him as much damage as the one large one would do. This is true at the present time, on account of the vulnerability of airplanes. Therefore this very general reasoning would seem to indicate that what we want, perhaps, in the airplane is the supermachine gun, or a multibarrel gun, which will fire automatically, or there could be two or three machine guns, so operated as to produce shots more or less continually spaced. What is desired is a very high-speed machine gun in delivering a large number of small projectiles.

This consideration, of course, is especially restricted to one airplane fighting another airplane in the air. The problem is different in the case of demolition or incendiary action, where gravity can be used and you can drop a number of large bombs of high explosives by the force of gravity. The single-seated fighting airplane at present carries but one man, who runs the machine, operates the gun, drops the bombs, and operates the wireless alone. They do not carry a second man, due to his weight, because speed is the prime object of the pursuit type of machine. These machines fight largely by aiming the entire machine at the adversary and firing through the propeller by pulling a string or pressing a button; so that with these high-speed machines you maneuver to gain the "upper berth" on your adversary and then use gravity to plane toward him, firing on the way, and then, deviating, you pass him, gain the "upper berth" if possible, and so on. From time to time special types make their appearance. This for a time puts the ascendency on one side or the other, only to be met later by a new type of machine of the enemy which generally is equal and often superior to the other side. So the development oscillates back and forth.

Mr. **Sherley.** Are they fighting those machines in groups as well as singly?

Col. **Squier.** Yes, sir. In regard to the separate use of groups of airplanes for individual exploits or attacks, independent of the regular tactical use with the Organized Army, it is now common to organize special flotillas of airplanes to precede and perform certain definite raids and demolitions, and the practice for many months has been to follow up such exploits. Under this head, of course, would come the special raids made upon certain points behind an enemy's lines, and upon such points of concentration as railroad centers, arsenals, and depots of all sorts. In these raids several types of airplanes are used, including the large burden-carrying machine that carries the explosives. These machines are organized together in groups and are protected on their flanks by fighting machines of the speedy type, just as torpedo boats protect battleships. The whole flotilla is launched and proceeds in this formation to the accomplishment of its object, the fighting machines fighting off the adversary and the bombers dropping their loads and finally returning to safe harbors. These expeditions are now of common occurrence on both sides. But perhaps the most dramatic raids of the air are made by the giant Zeppelins across the North Sea, against which the defense provided on land for direct fire have practically no effect. The only defense against such attacks is that of the fighting airplanes and the antiaircraft guns, and these have been developed abroad to an enormous extent, the large cities being now protected by very large numbers of antiaircraft guns as well as special fighting airplanes which patrol the air at certain distances from these cities and engage the enemy wherever found.

The question of the giant Zeppelin type is a moot question, and has been for many years. The United States now has funds which could be utilized for the development of the Zeppelin type without further authority from Congress, and the aviation section has asked for a specific policy to be announced as to whether or not it is desirable to proceed along these lines of development. This has resulted in the appointment of a joint board of the Army and Navy to determine that policy. It should be plainly recognized that the development of the Zeppelin means the creation of certain more or less new industries, such as that of aluminum alloys of various types, and the creation of a new class of shipbuilding in this country, and money alone is not sufficient. It is believed that if detailed scale drawings of the latest Zeppelin were lying on this table and the money to purchase them was also lying on the table, it would be impossible to construct, train the crew, and otherwise develop a modern fighting Zeppelin comparable with those now in use in Europe in two or three years, with every facility at our disposal. It would be expensive.

Mr. Sherley. Colonel, has the flying machine been used successfully in an offensive way against naval vessels?

ZEPPELINS.

Col. Squier. It is very difficult to get any definite information about that, as you know. My information, so far as I can have it corroborated, is, that in the North Sea battle—although I can not state this positively—Zeppelins were used by the German fleet.

Mr. Sherley. Is there any evidence of the use of airplanes or hydroplanes in an offensive way against naval vessels?

Col. **Squier.** They are patrolling the coast at all times; and intances have been reported of frequent attacks by airplanes on hostile ubmarines.

Mr. **Sherley.** I suppose their inability to attack ships of a large ize is due to the antiaircraft guns that those ships carry?

Col. **Squier.** Yes, sir.

Mr. **Sherley.** But in regard to submarines they are able to both detect and destroy them?

Col. **Squier.** There is hardly any doubt of this, although we have no authentic reports on this subject.

Mr. **Sherley.** In those cases I presume they fly very low, having no risk to incur as against any defensive weapon of the submarine?

Col. **Squier.** Yes, sir; that is true. I do not see any reason at all why an airplane could not destroy a submarine, and it is my belief that submarines have been attacked and destroyed that way. It has been impossible to get any information on the submarine question, as it is the fixed policy abroad to keep all matters of this kind in absolute secret. They think that the psychological effect of this policy is to be preferred to the effect of announcing a victory. For instance, submarines have been sent out and are not heard from again. They disappear and never come back, which is very annoying, and the effect of silence is better than that of announcing a victory. The submarines disappear, and they never know what has happened to them.

Mr. **Rauch.** Before you leave the discussion of the Zeppelin type I want to ask you whether, if one should be built by the United States, it would come under your organization?

Col. **Squier.** If it were suggested that they furnish one for the War Department, our desire would be that it be built jointly for the Army and Navy as a matter of economy and efficiency.

Mr. **Rauch.** With reference to their effectiveness, have they succeeded in reaching a higher altitude than airplanes?

Col. **Squier.** No, sir; I think the record is with the airplane at present. Airplanes go up to a height of more than 20,000 feet. I think the airplane still holds the record.

Mr. **Rauch.** What is the comparative carrying capacity of the two types, having in mind the larger airplane?

Col. **Squier.** Well, aeroplanes are getting to be pretty large now. Of course the dirigible is a burden-bearing machine. It carries 40 men. They can take a company and move it anywhere. That is natural, because it is a gas bag. However, they are getting closer together all the time.

Mr. **Rauch.** The press some time ago carried an account to the effect that some one of the European countries had constructed an airplane with a carrying capacity of 12 or 15 men.

Col. **Squier.** That is quite right. I know of airplanes carrying 11 men. They have engines of 800 horsepower, total, and cost from $50,000 to $75,000 each. Therefore, the figures we have been talking of the last two days are subject to radical changes. Airplanes six months ago were costing about $12,000, but those bids I showed you this morning average nearly $21,000. We do not know what they will be in a year or two, but some machines will probably be costing from $50,000 to $75,000 or $100,000.

Mr. **Sherley**. If a fighting airplane reaches a higher level than a Zeppelin, is the Zeppelin capable of any offensive action against the airplane while that relation exists?

Col. **Squier**. Yes, sir; because it has normally a machine-gun platform on top of the envelope, and it could presumably shoot up, but the "upper berth" is considered the great point in any air battle.

Mr. **Sherley**. Airplanes are attacking Zeppelins?

Col. **Squier**. Yes, sir.

Mr. **Sherley**. Successfully?

Col. **Squier**. Yes, sir; in several instances they have brought them down. They have dropped bombs on the Zeppelins by getting above them. There, again, the upper berth is the point of advantage, because all the airplane operator has to do is to drop the bomb on them.

Mr. **Eagan**. And destroy the gas bag?

Col. **Squier**. Yes, sir.

Mr. **Rauch**. I suppose the Zeppelin is regarded as having certain carrying qualities that are very desirable from the facts that you have improvised them by the use of a gas bag on an airplane, so as to operate it without its wings, making a craft that will perform some of the functions of a Zeppelin.

Col. **Squier**. That development for a simple observation appeals to me very much. We have not actually made one, but we will take prompt steps to do so. We hope to be able to tell you more about that.

Mr. **Sherley**. The value of that lies in the fact that it is able to float in the air——

Col. **Squier** (interposing). Yes, sir. Of course, such a machine would be an easy prey to a fast enemy machine. You would have to stay pretty close to home with it.

Mr. **Sherley**. Colonel, what has been done within the very short time that funds have been available for doing things in the modern sense in the matter of flying in the air, or what has been done by your corps since the appropriation by Congress was made available?

Col. **Squier**. I have prepared the following short résumé:

The following statement shows in a general way what has been done by t aviation section of the Signal Corps since April 5, 1916. It deals with actual flying that has been done in the last year as compared with the previo year, the ability of domestic airplane companies to deliver airplanes, use of money made available by the urgent deficiency appropriation of la year, expenditures under the present appropriations, and the various proje which have been inaugurated.

FLYING.

The following figures will give an idea as to the work accomplished fr Janauary 1, 1916, to December 1, 1916, as compared with the entire work d during the year 1915:

	1915	19
Total flights made	4,388	[illegible]
Hours in air	1,814	[illegible]

During the expedition into Mexico the First Aero Squadron at Columb were continually being used as dispatch bearers and mail carriers. Ab September 15 a daily airplane mail service was established between Columb N. Mex., and Colonia Dublan, Mexico.

In addition to the above cross-country flying there have been numerous flights made from San Diego, Cal., to Los Angeles, Cal., a distance of 120 miles, by pupils of the San Diego school. Similar flights have also been made by pupils and pilots at the Mineola school.

AIRPLANES PURCHASED.

The following shows a summary of the airplanes purchased since the original Wright machine was acquired in 1908:

Total number of airplanes purchased or under order			423
Destroyed and condemned	21		
Out of commission	27		
		48	
In service at present:			
Manila	4		
San Diego	30		
Mineola	18		
San Antonio	7		
Columbus and the border	14		
		73	
Under order but not delivered		302	
			423

AIRPLANE COMPANIES.

During the month of May, 1916, a board appointed by competent authority, visited the factories of various airplane manufacturers and investigated first, the organization and equipment; second, airplanes manufactured; and, third, the airplane power plant. The companies visited were the following: Aeromarine Engineering & Sales Co., the Burgess Co., Curtiss Aeroplane Co., the Eastern Aeroplane Co., the Empire State Aeroplane Co., the Gallaudet Aeroplane Co., the General Aeronautic Co., the Glenn L. Martin Co., the L. W. F. Engineering Co., the Thomas Aeroplane Co., Standard Aeroplane Corporation, Sturtevant Aeroplane Co.

URGENCY DEFICIENCY APPROPRIATION, $500,000.

From the allotment of $500,000 made under the urgency deficiency appropriation, fiscal year 1915–16, there were approximately 22 new airplanes purchased. The balance of about $250,000 was spent in maintenance, operation, and transportation.

APPROPRIATION, FISCAL YEAR 1916–17, $13,281,000.

Of this sum the amount of $7,432,003.13 has been obligated either in orders actually placed or by approved purchase. Of the amount obligated about $3,300,000 has been spent in the purchase of airplanes, hydroairplanes, extra engines, spare parts, and accessories, and the remainder for transportation, operation, and maintenance of schools and squadrons.

During the past six months, and since the allotment has become available, the following projects have been started:

First. The establishment of a thorough and competent inspection department, the members of which are especially selected civilians well versed in the manufacture of motors, airplanes, and transportation. This department has been stationed at all the larger airplane manufactories, who, while filling positions as inspectors, are also gathering valuable information for future use. Working in connection with this department are several expert advisers on the subject of airplanes and transportation therefor.

Second. The establishment of an experimental station for the thorough investigation of new equipment in the line of motors, airplanes, transportation, stabilizers, and other aero mechanisms, is well under way. The land has already been secured in the vicinity of Hampton, Va., and at present plans are being drawn up for the clearing of the land and erection of buildings.

Third. In the early part of November a balloon school was established at Fort Omaha, Nebr. Up to the present time there have been expenditures made to the sum of $35,000 for six balloons of various sizes and the necessary transportation and equipment to put them in use. The personnel for this school is now under consideration.

Data are being compiled with the object of placing orders for other lighter-than-air equipment.

Fourth. As regards the establishment of squadrons for the Regular Army and the Reserve Corps, orders have been placed for airplanes for approximately five squadrons in the regular service and six in the reserve, while others are now being placed for such additional equipment as will be necessary to organize these squadrons.

The training of the personnel for these squadrons is progressing as rapidly as possible.

Fifth. In addition to the training school at San Diego, Cal., similar schools have been established at Chicago, Ill., and Mineola, Long Island. These schools are under the direct supervision of the aviation section, and are in charge of aviation officers of the Regular Army.

As a means of increasing the facilities for aeronautical training, arrangements have been made with certain civilian schools throughout the country for the instruction of men designated to take the course for Reserve Corps commissions. The selection of these schools is governed by a thorough inspection of the equipment and course of instruction. Students at such schools will be constantly under the supervision of an aviation officer. In this manner it is hoped to soon have a substantial number of competent and well-trained aviators in the officers' reserve.

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[CONFIDENTIAL.]

FORTIFICATIONS BILL, 1919

HEARINGS

BEFORE

SUBCOMMITTEE OF HOUSE COMMITTEE ON APPROPRIATIONS

CONSISTING OF

MESSRS. WILLIAM P. BORLAND, CHAIRMAN; JOSEPH W. BYRNS,
JOHN J. EAGAN, JAMES W. GOOD, AND
C. BASCOM SLEMP

IN CHARGE OF

THE FORTIFICATIONS
APPROPRIATION BILL

SIXTY-FIFTH CONGRESS

SECOND SESSION

WASHINGTON
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1918

FORTIFICATIONS APPROPRIATION BILL, 1919.

HEARINGS CONDUCTED BY THE SUBCOMMITTEE, MESSRS. WILLIAM P. BORLAND (CHAIRMAN), JOSEPH W. BYRNS, JOHN J. EAGAN, JAMES W. GOOD, AND C. BASCOM SLEMP, OF THE COMMITTEE ON APPROPRIATIONS, HOUSE OF REPRESENTATIVES, IN CHARGE OF THE FORTIFICATIONS APPROPRIATION BILL, ON THE DAYS FOLLOWING, NAMELY:

MONDAY, MAY 13, 1918.

FORTIFICATIONS IN THE UNITED STATES AND INSULAR POSSESSIONS.

STATEMENT OF MAJ. GEN. WILLIAM M. BLACK, CHIEF OF ENGINEERS, ACCOMPANIED BY BRIG. GEN. FREDERIC V. ABBOT AND LIEUT. COL. J. M. WRIGHT, ASSISTANTS TO THE CHIEF OF ENGINEERS; BRIG. GEN. J. D. BARRETTE, ACTING CHIEF COAST ARTILLERY; COL. W. F. HASE, LIEUT. COL. C. E. BRIGHAM, ASSISTANTS, COAST ARTILLERY.

REPORT OF THE BOARD OF REVIEW.

Mr. BORLAND. Gentlemen, we want to take up, this morning, the estimates for the fortification bill; and I think it will develop that there have been very radical changes made in the estimate and in the program in the last few weeks, and possibly, in the last few days. The reason for those changes and the character of the changes, of course, are largely in the nature of military secrets. I have suggested to the gentlemen here that the committee, in its search for information upon which these estimates are based, will go into the matters fully and get the full information; and, then, only so much of it will be printed or transcribed as seems to be proper.

General, we will be glad to have you state for the record to what extent the Board of Review's program has been appropriated for, to what extent the appropriations have been expended, and the reason, if any, for deferring the further carrying out of that program.

Gen. BLACK. It has been appropriated for to the extent of about 50 per cent, and about 40 per cent has been completed. The continuation of work on the program has been deferred because it was deemed necessary to concentrate the energies of the country on the production of war material for use abroad.

Mr. BORLAND. That is in connection with the work of the Ordnance Department?

Gen. BLACK. That is true as to ordnance, to engineers, and to artillery.

Mr. BORLAND. Then, I understand that the completion of your program for the coast defenses, the completion of the engineering work, emplacements, etc., has been subordinated to the work of the field artillery and other necessary and more important work for the Army abroad?

Gen. BLACK. Yes, sir.

Mr. GOOD. Is that true with respect to contract authorizations as well as to actual appropriations?

Gen. BLACK. I can only speak for the engineers, and we do not make our fortifications by contract.

Mr. GOOD. And as to the production of ordnance, you are not informed?

Gen. BLACK. No.

Mr. SLEMP. Will there be any appreciable loss to the Government by delaying the program already begun?

Gen. BLACK. No; it will be a gain, and that is due to the increased cost of labor and of materials, so that the cost of fortifications, if constructed now, would be greater than the cost in normal times.

Mr. GOOD. To what extent has the Board of Review's program been modified or changed since it was originally adopted, two years ago?

Gen. BLACK. Not to any appreciable extent and not in any important particulars.

Mr. GOOD. That same Board of Review remains in existence?

Gen. BLACK. Yes, sir.

Mr. GOOD. And takes up these questions?

Gen. BLACK. It is an ex officio board, so to speak, but we have not met for over a year, I guess.

Mr. SLEMP. Since when have you been discontinuing work on the fortifications program?

Gen. BLACK. Since last fall.

Mr. SLEMP. And practically nothing has been done since then?

Gen. BLACK. Practically nothing. However, we did continue the work of filling in the Fort Tilden Reservation and getting that in good shape until that particular class of work was completed. That was done by hydraulic filling. We have done a lot of work like that there and a lot of work at Cape Henry, but the actual construction of the fortifications themselves has been suspended; that is, after we got this preliminary work finished.

Mr. SLEMP. Since September, 1917?

Gen. BLACK. No; I should put it since December; we worked up until about December of last year at Fort Tilden.

Gen. ABBOT. At Rockaway Beach we worked up until October, and there we were just finishing the hydraulic fill when I came to Washington, in October.

Gen. BLACK. At Cape Henry there is about the same story.

Mr. GOOD. Is there any difference in this decision to defer work on fortifications between the fortifications in continental United States and those in the insular possessions and Panama?

Gen. BLACK. We went ahead longer at Panama in working on the 12-inch batteries. When did we finish the structural work on the 12-inch batteries at Sandy Hook?

Gen. **Abbot.** They were finished early in October, or practically so.

Mr. **Good.** How about the work in the Hawaiian Islands?

Gen. **Black.** There is very little work going on there.

Col. **Wright.** We have spent about $170,000 there on the long-range guns.

CONSTRUCTION OF GUN AND MORTAR BATTERIES IN UNITED STATES.

(See p. 82.)

Mr. **Borland.** The first item in the bill is for the construction of gun and mortar batteries?

Gen. **Black.** For the reasons previously stated we ask that no further appropriation be made there now.

Mr. **Borland.** You have an estimate in for $3,241,000, which you want the committee to defer?

Gen. **Black.** Yes, sir.

Mr. **Borland.** What unexpended balance have you on hand with respect to the money received in the 1918 bill and the deficiency act? You had $5,000,000 all together?

Gen. **Black.** We have total cash available of $4,468,000.

Mr. **Borland.** That is unallotted?

Gen. **Black.** No, sir; a part of it is allotted. One million five hundred and sixty-seven thousand dollars has been allotted and $2,900,800 is unallotted.

Mr. **Borland.** I do not know whether I used the right word. Perhaps I should have said pledged?

Gen. **Black.** No part of the balances is covered by contracts.

Mr. **Borland.** You have simply allotted it to certain projects?

Gen. **Black.** Yes, sir. The way we do is that we come before you and state that certain work should have precedence, and, although the appropriation is a lump-sum appropriation, the allotments are made to the works as we have stated them to you.

Mr. **Borland.** Then after they are allotted a contract is entered into and the work is actually begun, the moneys become pledged?

CAPE HENRY, VA.

(See pp. 7, 10, 11, 43.)

Gen. **Black.** Yes, sir. I want to state that at Fort Story, Cape Henry, the specific works that we were going ahead with were, first, plans; second, repairs to buildings; third, sawing timber; fourth, construction of roadway; fifth, construction equipment; sixth, construction of railroad and purchasing railroad equipment; seventh, constructing office, storehouse, etc.; eighth, constructing plant; and ninth, removal and relocation of tracks of Norfolk-Southern Railroad; at Fisherman's Island, emergency emplacements and emergency magazines; at defenses of Hampton Roads, antiaircraft gun emplacements. These would all come out of our allotments, and as necessities arose we would go ahead and use them. Should some change in conditions or some emergency construction come in we have these available unallotted balances with which to go ahead.

Mr. **Borland.** The last time this bill was up there was some question about acquiring the right of way at Cape Henry. Has that matter been finally closed?

Gen. Black. I think it has.

Mr. Borland. Are you in possession of that land now?

Gen. Black. Yes, sir; I think that has all been cleared up.

Mr. Borland. Then, so far as your site at Cape Henry is concerned, your work is all done?

Gen. Black. I think so.

Mr. Borland. As to the work at Cape Henry, the committee understands that that work has been deferred in accordance with the general program you spoke about a few minutes ago?

Gen. Black. Yes, sir.

Mr. Borland. An additional reason appears there, in that labor is extremely scarce and in great demand in the vicinity of Norfolk?

Gen. Black. Yes, sir.

Mr. Borland. And it would very much add to the expense of the Government to do the work at this time?

Gen. Black. It would.

Mr. Borland. And no practical and immediate use could be made of it?

Gen. Black. That is true.

Mr. Borland. And those reasons largely determined the deferring of the work at Cape Henry?

Gen. Black. Yes, sir.

Mr. Slemp. Have any guns at all been installed at Cape Henry?

Gen. Black. There are some small, light guns there—6-inch guns—which were put in for antisubmarine defense.

Mr. Slemp. I do not suppose the guns at Fort Monroe would give much protection?

Gen. Black. Out at the entrance they would not at all. As far as Fort Monroe is concerned, a submarine could come up as far as our fortifications on the Potomac, except that it would have to travel on the surface, which would be a very hazardous thing for it to do. There is not depth of water enough, you know, because they do not like to operate except in about 60 feet of water. They draw about 14 or 15 feet when they are on the surface, and some of the larger ones draw more. I do not know what the exact draft is, but in order to submerge completely they can not have less than about 30 feet of water.

Mr. Slemp. What I meant was, because of the distance from Fort Monroe to the sea, the guns there would be of no use.

Gen. Black. That is right.

ROCKAWAY BEACH.

(See p. 10.)

Mr. Borland. What is the condition under this item of the work on the defenses at Rockaway Beach?

Gen. Abbot. On the new reservation there are 6-inch guns on pedestal mounts and on the adjacent reservation, to the eastward, there are mortars.

SAN PEDRO, CAL. (LOS ANGELES, CAL.).

(See p. 72.)

Mr. Borland. What is the condition of the fortification work at San Pedro (Los Angeles)?

Col. Wright. The fortifications at San Pedro consist of two mortar batteries and four gun batteries. The mortar batteries at the present time are completed except for minor details, the armament is mounted, and the batteries have been transferred to the Artillery.

Mr. **Borland**. They have actually been turned over to the Artillery?

Col. **Wright**. Yes, sir. For two of the gun batteries the guns are on hand and are being mounted at the present time. The engineer work is practically completed. Those batteries have also been transferred to the Artillery. As to the other two gun batteries, the carriages are being mounted, but the guns are not yet on hand. Those batteries have also been transferred.

Mr. **Borland**. What remains to be completed?

Col. **Wright**. The completion of the mounting of guns which are actually on hand at the batteries. The work of mounting is in progress. At two other gun batteries the carriages are being mounted at the present time, but the guns have not yet arrived at the emplacements. The mortar batteries are completed and turned over. The engineer work you will see, sir, is practically completed in all those cases.

SAN DIEGO, CAL.

(See pp. 8, 28.)

Mr. **Borland**. Is there work remaining to be done at San Diego?

Col. **Wright**. At San Diego we are still working on the fire-control project. That is still to be completed.

Mr. **Good**. What was allotted for San Pedro.

Col. **Wright**. The total estimate was $1,050,000, and the total amount was appropriated. The allotments were $837,750.

Mr. **Good**. What is the unexpended balance?

Col. **Wright**. $212,250.

Mr. **Good**. Will you be able to complete the entire project within the estimate?

Col. **Wright**. Yes, sir.

Mr. **Good**. Will there be any saving?

Col. **Wright**. I think there probably will be; yes, sir.

Mr. **Good**. And you contemplate to have all the engineering work done in the near future?

Col. **Wright**. Yes, sir.

Mr. **Good**. Do you know the extent to which the Ordnance Department has been able to furnish the ordnance?

Col. **Wright**. The ordnance equipment is apparently all on hand, with the exception of two guns which have not yet arrived at the emplacements. Just where they are I am not able to say.

CAPE HENRY, VA.

(See pp. 5, 10, 11, 43.)

Mr. **Borland**. Colonel, give us the same information in regard to Cape Henry.

Col. **Wright**. The total estimate for the Fort Story construction, plant, site, etc., amounts to $2,085,000. An appropriation of $1,144,000 has been made, leaving to be allotted to complete the project $941,000. This $941,000 was included in the estimates which were submitted to you gentlemen, and which, in accordance with the statement which Gen. Black has already made, we now request that we be permitted to withdraw.

Mr. Good. Did you give the amount you had allotted there?

Col. Wright. Since January 1, 1917, our total allotments for the Fort Story work have amounted to $378,100.

Mr. Borland. You have, then, a sufficient unexpended balance for any immediate work you are able to do on that project?

Col. Wright. Yes, sir.

Mr. Good. What is your unexpended balance?

Col. Wright. We have an allotted balance of $129,405.79 and an unallotted balance of $758,300, making the total unexpended balance $887,705.79.

Mr. Slemp. Most of the money that has been expended there has been expended for the acquisition of the property and the rights of way, etc.?

Col. Wright. Yes; and preliminary work in connection with the wharf and construction railroad and the movement of the Norfolk & Southern track.

Mr. Slemp. But no emplacements have been built?

Col. Wright. No.

Mr. Slemp. And none begun?

Col. Wright. No. We have not been able to get that far with the work.

Mr. Borland. The money has been spent for the acquisition of the site and preparing the site and the construction plant?

Col. Wright. And preparations for the construction of the wharf. You will remember from previous hearings that the Norfolk & Southern tracks ran directly through the battery site and we had long negotiations with them as to changing the position of the railroad.

Mr. Borland. And my understanding is that you exchanged a right of way with them and gave them another right of way and took their right of way?

Col. Wright. Yes, sir.

Mr. Slemp. What do you mean by the construction of the plant?

Col. Wright. The plant for the construction of the batteries—concrete mixers, boilers, locomotives, and things of that kind.

Mr. Slemp. That has been done, has it?

Col. Wright. Yes; partially.

Mr. Good. You have not commenced the emplacement work proper there?

Col. Wright. No, sir.

Mr. Good. Not for any of the armament?

Col. Wright. No, sir; the armament is all included in Gen. Black's statement made at the first part of the hearing.

Mr. Good. Regarding Cape Henry, if I understand the situation it is this: You have not commenced any work on the emplacements as yet and do not intend to do so during the next fiscal year?

Col. Wright. That is correct.

SAN DIEGO, CAL.

(See pp. 7, 28.)

Mr. Borland. I want to ask you about the work at San Diego. Is there any work being done there?

Col. Wright. At San Diego we are at present working on the fire control, but that does not come in this particular portion of the bill.

Mr. **Borland**. Some suggestion was made that there should be another battery installed there. Have any steps been taken to enlarge the program of the fortifications at San Diego?

Col. **Wright**. I think not, sir. The project that we have contemplates the installation of two mortar batteries, and that project is practically completed so far as the engineer department work is concerned.

Mr. **Borland**. What is the size of those mortars?

Col. **Wright**. 12-inch.

Mr. **Borland**. It has been suggested that a 10-inch battery be installed. Nothing has been done about that?

Col. **Wright**. No, sir.

Mr. **Borland**. So that your project there is completed except as to the fire control?

Col. **Wright**. Yes, sir. I may say that new 10-inch batteries will certainly not be installed in the coast defenses because the 10-inch gun is considered practically obsolete as a coast defense weapon at the present time.

Mr. **Borland**. I understand that is true, but the purpose of these guns was to protect some near-by off-shore area just beyond Point Loma. My understanding was that there was an area in there that they thought should be protected by a shore battery.

Col. **Wright**. If there is such a project, we have no knowledge of it.

[Note.—Since the hearings information has been received that additional batteries of guns have been added to the Board of Review project for the coast defenses of San Diego.]

Mr. **Borland**. What about the roads and approaches to the fortifications at San Diego? Were they not in an incomplete state last year?

Col. **Wright**. I think we are very nearly through with that work, sir, at San Diego; at least, all of my information is to that effect.

Mr. **Borland**. Is that under this item?

Col. **Wright**. No. A separate appropriation of $40,000 was made for this road and sewer construction at San Diego.

Mr. **Borland**. What is the condition of the road and grading work?

Col. **Wright**. If my recollection is correct, we are at present debating with the quartermaster as to who will maintain these roads. The work has been completed at San Diego and the roads have served their purpose so far as the Engineer Department is concerned, and inasmuch as they will be needed by the Quartermaster Department for the maintenance and for the ordinary quartermaster operations of the post it is now our desire to turn them over to the Quartermaster Department for maintenance. As you know, they are charged with road construction on posts. These roads were merely constructed by us as an incident to the battery construction and will not be needed further for battery-construction work.

Mr. **Borland**. Therefore their maintenance ought to fall on the Quartermaster Department?

Col. **Wright**. Yes.

Mr. **Good**. What is the condition of your balances so far as the San Diego project is concerned?

Col. WRIGHT. At San Diego we have an allotted balance of $4,046.20 and no unallotted balance.

Mr. GOOD. What is that for?

Col. WRIGHT. It was allotted for work in connection with one of the mortar batteries.

Mr. GOOD. Then you have completed the grading that you estimated for in last year's bill?

Col. WRIGHT. Yes, sir.

Mr. GOOD. Will you need any money, then, for work at San Diego for the next fiscal year?

Col. WRIGHT. We do not expect to come back for any battery construction money; no, sir. The fire-control work is in progress at the present time, and I will discuss that later on.

CAPE HENRY.

(See pp. 5, 7, 11, 43.)

Mr. GOOD. Going back to Cape Henry, how much of an unallotted balance have you?

Col. WRIGHT. The unallotted balance at Cape Henry is $758,300.

Mr. GOOD. You do not propose to use any of that during the fiscal year ending June 30, 1919, or between this time and July 1?

Col. WRIGHT. In all probability we will not use any of that, sir. There is an allotted balance for the Norfolk work of $129,400, which, I should say, would accomplish all the preliminary work we will be able to do.

Mr. GOOD. That is, work preliminary to putting in your emplacements?

Col. WRIGHT. Yes, sir.

Mr. SLEMP. How long a time would it take to complete your Norfolk project if you worked along normal lines?

Gen. ABBOT. It altogether depends on how much plant we buy. We can build them cheaper by building the first battery and then using the same plant for the others. For instance, I estimated it would take about five years to complete the heavy emplacements at Rockaway Beach, using one plant, but by using two plants we would be able to get through in about two years and a half, but that saving of time increases the cost of the batteries very much.

Mr. SLEMP. So that even if you were very expeditious in the matter you would not be able to complete that fortification work before about 1920 or 1921?

Gen. ABBOT. If we have four construction plants, we can complete one of these batteries in about eight or nine months, if you put all of the plants at it, but that costs out of all proportion, and it depends on how much urgency there is.

ROCKAWAY BEACH.

(See p. 6.)

Mr. SLEMP. You have had one plant down there?

Gen. ABBOT. At Rockaway Beach we are proposing to buy three plants and get through in about two years, I should judge.

CAPE HENRY, VA.

(See pp. 5, 7, 10, 43.)

Mr. **Slemp.** What about Cape Henry?

Gen. **Abbot.** At Cape Henry I do not think we have any construction plant to speak of. Some of the railroad material is there, and I suspect some of the road material.

Col. **Wright.** They have reported 55 per cent of the construction plant as purchased.

Mr. **Slemp.** That would provide one plant or two plants?

Gen. **Abbot.** The general basis is four years, so that that would correspond with about two plants to do the work down there, because they have two batteries to a plant.

Mr. **Slemp.** What percentage of the work is now completed?

Gen. **Abbot.** I have not the figures for that.

Mr. **Byrns.** Did I understand you to say a moment ago that it had been finally determined that you would not expend any portion of this unallotted sum of $759,000 during the next fiscal year?

Col. **Wright.** In all probability that will be the case, because we have an allotted balance in the neighborhood of $130,000, which will probably be sufficient to provide for our preliminary work; and, as Gen. Black told you gentlemen this morning, we do not propose to go ahead with the actual emplacement construction.

LONG-RANGE BATTERIES IN THE CONTINENTAL UNITED STATES.

Mr. **Borland.** Before we pass to the work in the insular possessions, are you doing work at any other points in the United States?

Col. **Wright.** Yes; at several other points.

Mr. **Borland.** What is the next point?

Col. **Wright.** The principal features under construction are the 12-inch long-range batteries.

Gen. **Abbot.** High-angle-fire batteries.

Mr. **Borland.** Where?

Col. **Wright.** There are batteries under construction at Portland, Me., and we are just about starting work on two batteries in Boston Harbor.

Gen. **Abbot.** They were delayed there by trouble in getting the land on which to locate.

Col. **Wright.** We have commenced preliminary work on a battery at New Bedford; two batteries are completed at Sandy Hook; one battery is well along at Delaware Bay; preliminary work has been finished on one battery at Pensacola and the concrete work is in progress; two batteries are being built at Galveston, of which one is reported 60 per cent completed and the other 55 per cent completed; and one battery is being built at San Francisco. That battery at San Francisco is, to a certain extent, an experimental battery. It is not exactly according to the usual type, and detached magazines are being used.

Mr. **Borland.** These are new batteries? They are not the modernizing of old emplacements?

Col. **Wright.** No.

Mr. Borland. Nor raising the angle of fire of existing batteries?

Col. Wright. No.

Mr. Borland. They are newly constructed batteries?

Col. Wright. Yes. The only thing old in connection with them is the guns.

Mr. Borland. In other words, you are using guns formerly placed at those forts?

Col. Wright. No; they have not been emplaced at all.

Gen. Abbot. They were in store at the Ordnance Department as surplus guns, you might say. They were at the Sandy Hook proving ground.

Mr. Borland. Is this in furtherance of the Board of Review's program?

Gen. Abbot. It is in accordance with that program; yes.

Mr. Borland. These are batteries that were called for by the Board of Review's program?

Gen. Barrette. Yes; but there were modifications.

Mr. Borland. In what respect were there modifications?

Gen. Barrette. The Board of Review put those in to supply long-range guns; these 12-inch guns on barbette carriages reach a range of approximately 30,000 yards.

Mr. Borland. These guns are for mounting on harbette carriages?

Gen. Barrette. Yes, sir.

Mr. Borland. And are not disappearing guns?

Gen. Barrette. No.

Mr. Borland. What elevation was given?

Gen. Barrette. Thirty degrees.

Mr. Borland. And the guns that are to be used in these batteries are a part of your reserve supply of guns that have been at the proving grounds?

Gen. Barrette. Yes, sir.

Mr. Borland. Does your program call for keeping a certain number of reserve guns on hand to replace guns that need rerifling and repairing?

Gen. Barrette. In this case that provision had been made; they had them at Sandy Hook in stock as spares.

Mr. Borland. How do you replace those spare guns?

Gen. Barrette. No replacement has been provided for those, sir.

Mr. Borland. You are reducing your stock of spare guns?

Gen. Barrette. Yes, sir.

Mr. Borland. How many?

Gen. Barrette. The total number of those guns is 36.

Mr. Borland. Thirty-six 12-inch guns?

Gen. Barrette. Yes, sir.

Mr. Borland. Have you an estimate in this bill for keeping up your reserve stock of spare guns?

Gen. Abbot. That would be in the ordnance estimate. You see, the engineers and the ordnance have kept very closely in step with reference to the gun carriages because they do not wear out very much; we build an emplacement for each gun carriage and the Ordnance Department provides extra guns to replace those which do wear out, and the effort in the past has been to keep an effeective weapon for each gun carriage. That has been the theory in the past.

Mr. **Borland**. What is there that is peculiar about that emplacement at San Francisco?

Col. **Wright**. The emplacement consists only of gun blocks and loading platforms; the magazines and the ammunition service are removed some distance from the batteries. The ordinary emplacement consists not only of the gun block and the loading platform, but also the arrangements for ammunition service—the storage of ammunition and provision for its transfer to the guns. In this instance we are putting in gun blocks and loading platforms only and providing for the storage of the projectiles in the magazines of adjacent batteries, which are already constructed. The point at issue is whether we can get a satisfactory ammunition service for those guns by having our magazines located some distance from the emplacement itself.

Mr. **Borland**. What is the distance from the actual emplacement?

Col. **Wright**. I am not acquainted with that point.

Mr. **Borland**. What is the weight of the projectiles that have to be transported?

Col. **Wright**. The weight of a 12-inch projectile is 1,046 pounds.

Mr. **Borland**. How is it transported to the battery?

Col. **Wright**. Ordinarily it is by means of hand trucks.

Mr. **Borland**. Would that answer in case of the active use of the battery?

Col. **Wright**. It would if your magazines were right at the battery.

Mr. **Borland**. I am speaking of this case where the magazine is not at the battery.

Col. **Wright**. In this particular instance, I believe there has been some talk of the use of trucks which are provided with motor drives. That is correct, is it not?

Gen. **Barrette**. Yes; they propose to use motor trucks between the magazines and the guns. We want the magazines in a protected place, away from the guns, and use motor trucks to get the ammunition to the guns.

Mr. **Borland**. What is the condition of your allotments under these projects that you have named; that is, under these 12-inch gun projects?

Col. **Wright**. At Portland, Me., we have an estimate of $250,000, and the full amount has been allotted.

At Boston for one battery the estimate is $365,000, and we have made an allotment for that amount; for another the estimate is $290,000, but no allotment has been made on account of the fact that the site has been acquired only recently. At New Bedford the full allotment has been made.

Mr. **Borland**. What is the full allotment.

Col. **Wright**. $250,000. At Sandy Hook the full allotment for two batteries, $656,000, has been made.

Mr. **Good**. What do you mean by the full allotment?

Col. **Wright**. The full amount of the estimated cost which is sent in by the district officers who are charged with the construction.

Gen. **Abbot**. The superstructures of these batteries are practically identical, the difference in the estimates and the costs being largely due to foundation questions.

Mr. **Borland**. How are your estimates running under the present cost of labor and material? Are you keeping within your estimates?

Col. WRIGHT. The only completed batteries, or practically completed batteries, are the two at Sandy Hook. Gen. Abbot can give you the figures on that because he was the constructing officer on those batteries.

Gen. ABBOT. We succeeded in getting them through for the estimate, but it was some hard going. If we had not had a very effective organization of labor forces and efficient plant we could not have gotten through at that cost.

Mr. BORLAND. Just give us the remaining allotments, so we will have them in the record.

Col. WRIGHT. At Delaware Bay the estimate for two batteries is $650,000, which amount has been allotted; at Pensacola the estimate is $218,000, which has been allotted. At Galveston, two batteries, each $276,000, which sums have been allotted. At the experimental battery at San Francisco the estimate was $236,500, but that was based on the type plan battery. For the construction of the gun blocks and loading platforms only, in order to determine the practicability of this question of detached magazines, $101,530 was allotted; the remainder is held in hand and will be applied to this battery in case it is determined that the storage of the ammunition at some distance from the guns in the manner proposed is not practicable.

Mr. BORLAND. Do these battery constructions call for shelters or living quarters for the men adjacent to the loading platforms?

Col. WRIGHT. Not these batteries.

Gen. ABBOT. In some cases where we have a parados, required to protect the battery from fire from the rear, we generally use the parados for putting in bunk rooms in which the men can be accommodated, but if we have no parados there is no room in the battery for that specific purpose. We utilize the parados for that purpose when we have one.

Mr. BORLAND. The presence of the parados is purely an incident to the battery construction?

Gen. ABBOT. Yes; if you expect to have fire from both front and rear you have a parados.

Mr. BORLAND. As a part of your typical battery construction you do not provide living quarters for the men?

Gen. ABBOT. No. There is generally in the passageways enough room for the number of men who are on watch; there is enough room to keep them out of the weather, but when it comes to day and night service there is no room to quarter the entire set of reliefs at the emplacements; the men must live elsewhere.

Mr. BORLAND. What is the custom in that regard, if there is any custom, in the seacoast defenses of other countries? Do not the Coast Artillery men live right at the guns?

Gen. ABBOT. It is very variable, so far as we know. Those are not very easy points to find out, because they do not publish them, but we do find out a good deal about that. However, my knowledge is about eight years old, because I have not been on the fortifications and in Washington since eight years ago, so that my information would be very much out of date. If Gen. Winslow were here, he could advise you, because he has kept up to date on that.

Gen. BARRETTE. I was abroad in 1913, and I learned that the British have detached barracks right near the guns.

Mr. BORLAND. All of the allotments that you have detailed, Colonel, are subject to the same statement that was made at the beginning—that you are making them secondary to other projects and the use of the money elsewhere.

Col. WRIGHT. I would not say that, as regards these batteries, because on most of the batteries work has been carried on to a very considerable extent, and the provision of matériel for these batteries by the Ordnance Department is not holding up existing work. The plans for it are all complete.

Mr. BORLAND. Give us the ones you expect to proceed with during the current year.

Col. WRIGHT. All of them—all of the 12-inch batteries.

Mr. BORLAND. Is that embraced in this construction of gun and mortar batteries item?

Col. WRIGHT. No; they have been appropriated for in previous acts. The sum you have there, sir—$3,241,000—is embraced in four projects, namely, Long Island Sound, Rockaway Beach, Fort Story, and Fort Funston. Fort Story is at Cape Henry and Fort Funston is at San Francisco. All of those projects contemplate the installation of 16-inch guns and 16-inch mortars, and with respect to that armament Gen. Black raised that point this morning.

Mr. BORLAND. And that is the estimate for 1919?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. The appropriations for 1918 embrace, as I understand it, $4,468,000 of available funds that you do not intend to use this year.

Mr. BORLAND. What I want to get at is, are these allotments you are now giving us embraced in the $4,468,000, or is that $4,468,000 an unallotted balance?

Col. WRIGHT. The $4,468,000 is made up of $2,900,816.86 of unallotted balance March 31, and $1,567,463.13 of allotted balance; that is, an available balance from allotments already made.

Mr. BORLAND. What do you mean by "available balance," allotments which have been made but which you do not intend to spend?

Col. WRIGHT. The allotments have been made and not entirely expended. The work is in progress, but the work has not been finished and this amount of money remains unexpended.

Mr. BORLAND. What we want to get at, Colonel, is how much, if any, of this money we could safely divert to other uses if we had to. This $2,900,000, of course, I understand, is a free balance. That is a free, unallotted balance that you have not obligated in any way?

Col. WRIGHT. That is correct, sir.

Mr. BORLAND. Now, as to the $1,567,000, you have allotted that and have the work in progress?

Col. WRIGHT. That is correct, sir.

Mr. BORLAND. Some of which, of course, you can not well discontinue without loss?

Col. WRIGHT. I think that might be said of most of it.

Gen. ABBOT. The question is in a rather complicated shape. This new estimate which we are asking the omission of in the present bill would match up with ordnance material for which they were going to ask new funds in this bill. Now the balance which we have on hand, which looks large, is to match up with the ordnance material for which you appropriated the last time. We want to hold that money because the Ordnance may be able to go ahead with their work unless you take away their balance also.

Mr. Borland. And therefore, General, we will want to have those facts in our minds when we come to examine the Ordnance people.

Gen. Abbot. Precisely.

Mr. Borland. We do not want to estimate that you have $4,500.000 on hand which you do not need when the fact is, perhaps, you have obligated or must obligate part of it.

Gen. Abbot. We have promised the Ordnance Department emplacements for their guns. Those emplacements will cost this much money. Now, the Ordnance people have promised us guns for that many emplacements and also the carriages. They will give them when the Council of National Defense lets them get at their work. Now, what both of us want to do is to keep our money so that as soon as public policy permits it we can go ahead and we will then match together like two cogwheels.

Mr. Borland. And what we want to do is to make our money go as far as we can at the immediate moment?

Gen. Abbot. That is exactly the point.

Mr. Slemp. You do not anticipate any change in the policy of the Council of National Defense in regard to 16-inch guns within the year, do you?

Gen. Abbot. It depends altogether on what happens across the water.

Mr. Borland. Let me return to this $1,567,000. That is an allotment to existing projects in course of construction?

Col. Wright. That is correct, sir.

Mr. Borland. And how much of that, if any, would you say could safely be held in abeyance in view of existing conditions of shortage of labor, material, and so on?

Col. Wright. I do not think any of that should be withdrawn, sir.

Gen. Abbot. That is right. As to the other part, which we have not yet put into anybody's hands to start construction, if that is withdrawn, all that the committee would have to look out for would be to see that a corresponding amount of ordnance work was correspondingly postponed.

Mr. Borland. Yes; I understand we do not want to push them along to the point where they will have guns ready for you and you will have no emplacements for the guns.

Col. Wright. Yes. The basis on which we placed our request for the withdrawal of this year's estimates was very largely the fact that we had this balance on hand which, if the Ordnance should be able to commence work, is sufficient to hold us until another bill can be passed.

Mr. Good. Take the emplacements at Portland, the estimate there was for $240,000, and I understood you to say that had been allotted.

Col. Wright. Yes, sir.

Mr. Good. It is the intention to construct those emplacements?

Gen. Abbot. They are very largely completed now. The last time I inspected the battery, the concrete was coming along quite well, and that was some time in last August or September.

Mr. Good. The next one you gave was Boston, where the estimate war for $930,000. What was the amount allotted?

Col. WRIGHT. The estimate was $365,000 at one location and $290,000 at another, both in Boston Harbor.

Mr. GOOD. How much has been appropriated for the emplacement work at Boston?

Col. WRIGHT. I can not give you that on account of the fact that the 12-inch long-range batteries were appropriated for in three different acts. The total amount appropriated for 24 guns to be emplaced in continental United States is $3,074,500.

Mr. GOOD. Yes; but have you the details there of the emplacement work at Boston?

Col. WRIGHT. I can only give you our estimate.

Mr. GOOD. How much was your estimate?

Col. WRIGHT. The estimate is $365,000 for one battery and $290,000 for another.

Mr. GOOD. How much of that have you allotted?

Col. WRIGHT. We have allotted the money for the first battery.

Mr. GOOD. And you have not allotted the money for the second?

Col. WRIGHT. No, sir.

Mr. GOOD. And do you expect to construct the first battery during the next fiscal year?

Col. WRIGHT. Yes, sir.

Mr. GOOD. Do you expect to commence the second battery during the next fiscal year?

Col. WRIGHT. Yes, sir.

Mr. GOOD. Will you utilize therefore the entire estimate for those two places during the next fiscal year?

Col. WRIGHT. We want to utilize the entire estimate during the next fiscal year if we can. We will commence work and carry it on as far as practicable in that time. The time of construction of one of these 12-inch long-range batteries is usually more than a year.

Gen. ABBOT. About eight months. I got four of such emplacements built in eight months but that was with night and day work.

Mr. GOOD. You think, then, that this fund should not be interfered with?

Col. WRIGHT. Yes, sir.

Mr. GOOD. How about the emplacement work at New Bedford?

Col. WRIGHT. That work has also been allotted for and is in progress.

Mr. GOOD. When will it be completed?

Col. WRIGHT. We have not an estimate as to that.

Gen. ABBOT. I inspected that some time in the early part of August and the foundation concrete was going in at that time.

Mr. GOOD. Will it be completed within the estimated cost?

Gen. ABBOT. I presume it will, although the question of labor and material costs may affect it.

Mr. GOOD. What was the appropriation for the emplacements at Long Island?

Col. WRIGHT. Long Island, sir, is one of the projects which we are deferring.

Mr. GOOD. What is the state of your balances there?

Col. WRIGHT. No money has yet been appropriated for the construction on Long Island.

Mr. BORLAND. Is that the Rockaway Beach project?

Col. WRIGHT. No, sir; this is the eastern entrance to Long Island Sound.

Mr. GOOD. How about Sandy Hook?

Col. WRIGHT. At Sandy Hook two 12-inch long-range batteries have been completed.

Mr. GOOD. Are you engaged in the construction of emplacements for other batteries there now?

Col. WRIGHT. I think not.

Mr. GOOD. What is the condition of your balances?

Gen. ABBOT. I think there was about $20,000 left when we got the work finished.

Mr. GOOD. And it is not contemplated to do any other emplacement work at Sandy Hook during the next fiscal year?

Gen. ABBOT. No, sir.

Mr. GOOD. And you have already stated that it is not contemplated to do any emplacement work at Cape Henry?

Col. WRIGHT. That is correct.

Mr. GOOD. At Pensacola you had an allotment of $240,000.

Col. WRIGHT. Two hundred and eighteen thousand dollars, and work is in progress at Pensacola.

Mr. GOOD. When will it be completed?

Col. WRIGHT. I presume within the year, in all probability, judging by the rate Gen. Abbot has obtained in his battery construction.

Mr. GOOD. What allotment did you have for emplacement work at New Orleans?

Col. WRIGHT. None.

Mr. SLEMP. Nor Charleston?

Col. WRIGHT. None for Charleston.

Mr. GOOD. How about Galveston?

Col. WRIGHT. At Galveston we have two 12-inch long-range batteries under construction, one of them is 60 per cent completed and the other 55 per cent completed.

Mr. GOOD. The work is progressing upon the one that is not completed?

Col. WRIGHT. Work is progressing upon both batteries.

Mr. GOOD. Are you doing any emplacement work at Los Angeles?

Col. WRIGHT. The emplacement work there, sir, is practically completed. I think we found this morning that it is all done except the mounting of the guns.

Mr. GOOD. Did you give the state of your balances at Los Angeles?

Col. WRIGHT. Yes, sir. We are going to make quite a saving, we think, at Los Angeles, on the battery construction work. The unallotted balance at the present time is $212,000, and the allotted balance is practically $56,000.

Mr. GOOD. Is that sufficient to complete the work?

Col. WRIGHT. From the information which I have of the present status of the batteries, I should think it would be.

Mr. GOOD. Then you will have something like an unexpended balance of over $200,000 there?

Col. WRIGHT. We hope so, yes, sir; though it may fall short of that figure.

Mr. GOOD. What is the condition of the work at San Francisco?

Col. **Wright**. At San Francisco the only emplacements on which we are working at present form the experimental 12-inch battery of which I was speaking.

Mr. **Good**. You have not commenced your permanent emplacement work there for the permanent battery?

Col. **Wright**. It is going to be built into the permanent battery and none of the work we do there will be lost. If we find that our detached magazines will not do, the parts which we are putting up, namely, the gun blocks, loading platforms, etc., will be built into the permanent battery by merely adding the magazine rooms to what we have already constructed.

Mr. **Good**. I am not sure whether you gave the unexpended balances with regard to San Francisco or not. If not, kindly state what they are.

Col. **Wright**. The unallotted balance at San Francisco is $134,907. The allotted balance for the 12-inch experimental battery is $14,482.47.

Mr. **Good**. Is it proposed to make any further allotments for emplacement work during the next year at San Francisco?

Col. **Wright**. That depends, sir, on the result of this experiment. These gentlemen [indicating] are the ones to decide that for us. If they say the ammunition service with the emplacement as it is at present is satisfactory, this balance which we have in hand of approximately $135,000 will not be required.

Mr. **Good**. When will the result of that experiment be known?

Col. **Wright**. I can not tell you about that, sir. The battery work has not yet progressed sufficiently far to enable us to make the experiment. I received word in the last progress report that the base rings of the gun carriages in that battery had just been put in place; so it is still necessary to mount the carriages and the guns.

Mr. **Good**. How much time will be required to do the work before the test can be made?

Gen. **Abbot**. It makes considerable difference in a battery how soon you fire the gun. It takes time for concrete to acquire its full strength, and while it is probably safe to fire a gun within two months after the last concrete has been placed, it is safer to wait several months. We have, in numerous cases, fired within six weeks of the time our last concrete has been put in; and if you know that is going to happen, you put a little more cement in the concrete, which accelerates the hardening, and you are then ready for it at that time. The targets in the tests at Sandy Hook were fired at about two months after the concrete set, and they held up, but it is a little unwise to fire from a battery which has not had time to reach its full concrete hardness.

Mr. **Good**. You very likely will make no tests so far as the guns are concerned to determine what you shall do in the future before six or nine months?

Gen. **Abbot**. I would say five or six months, anyway, probably.

Mr. **Good**. What is the condition of your work at Puget Sound?

Col. **Wright**. We have nothing on hand there with the exception of some temporary work. There is no permanent installation in hand. There is the project for Puget Sound which contemplates 16-inch armament.

Mr. Good. Has any allotment been made for the emplacements?

Col. Wright. The project has not yet been appropriated for.

Mr. Borland. Is that embraced in the estimates of this year?

Col. Wright. No, sir; it is not.

Mr. Good. How about Columbia?

Col. Wright. That is in the same situation.

EMPLACEMENTS FOR ANTIAIRCRAFT GUNS.

Mr. Good. Last year Col. Winslow spoke about the work of building emplacements for the antiaircraft guns, and there seemed to be some trouble with regard to the location of those emplacements. What is the situation at present?

Mr. Borland. In the first place, for the information of the members of the committee who were not present at the hearings of last year, you may tell us what the situation was then and what the change has been, so we will know exactly both the previous policy and the present policy.

Col. Wright. The previous project for antiaircraft defense contemplated the emplacement in the continental United States of 406 3-inch antiaircraft guns on fixed mounts, what we call pedestal mounts. In addition to those, there were 135 of these guns for use in the insular possessions and the Panama Canal, making a total of 541 of the 3-inch fixed-mount antiaircraft guns which were to be emplaced. Some time last December, I think it was, the Ordnance Department brought up the question of antiaircraft defense by stating that they had at that time in the course of production about 160 of these 3-inch fixed-mount guns. They also stated they were developing an antiaircraft gun of 4.7-inch caliber on a mobile mount which would have very considerably greater range and would fire a shell practically three times as heavy as the 3-inch shell. That gun would, of course, be very much more desirable for antiaircraft defense than the 3-inch gun, both on account of its greater power and on account of its mobility; and in view of that fact it has been determined that emplacement of these 3-inch antiaircraft guns will be limited to the guns which the Ordnance Department already has in the course of production, that no more of the 3-inch guns will be constructed, and that the antiaircraft defense to be later provided for will consist of the 4.7-inch guns on the mobile mounts.

Mr. Borland. Your original plan called for four hundred and six 3-inch guns?

Col. Wright. In the United States; yes.

Mr. Borland. And 135 in the insular possessions and Panama?

Col. Wright. Yes; a total of 541.

Mr. Borland. And the Ordnance Department has actually under construction 160 of those guns?

Col. Wright. Yes, sir; 161, to be exact. One of them has been used for experimental and practice work at the Sandy Hook Proving Grounds, leaving 160 actually available for emplacement.

Mr. Slemp. Have they actually been built?

Col. Wright. Quite a number of them have been built; in fact, nearly all of them.

Mr. Borland. Those 3-inch guns are for pedestal mounts?

Col. Wright. Yes, sir; fixed mounts.

Mr. **Borland.** They are mounted in a little pit, are they not?

Col. **Wright.** The emplacement is a circular section of concrete which has a slight depression in the middle, in which the pedestal of the gun is set.

Mr. **Borland.** On account of the change in the plans of the department, you are not going to make any more of those 3-inch guns?

Col. **Wright.** That is correct.

Mr. **Borland.** You are going to adopt the 4.7-inch gun?

Col. **Wright.** Yes, sir.

Mr. **Borland.** And the 4.7's are not mounted on pedestals, but are on railway mounts, are they?

Col. **Wright.** No, sir; the 4.7 gun is mounted on a trailer which is drawn by a caterpillar tractor, and I believe that the wishes of the Coast Artillery are that some of these guns shall also be mounted on railway mounts, in order to take advantage of the much greater mobility which could be secured by moving them around on the street car or railroad tracks which exist in large cities.

Mr. **Borland.** How many of the 4.7 guns are contemplated in this new program?

Col. **Wright.** We have not a definite program for the 4.7. The Ordnance has one gun coming through which is what they call a pilot gun. The delivery of that gun is expected next month, and immediately upon the completion of the tests of that gun they expect that they will be able to begin production. I took that matter up with the Ordnance Department just two days ago, and they informed me that there had been some difficulty in the production of gun forgings in this country, and they would not give me a definite date as to when quantity production of this 4.7 gun could be commenced.

Mr. **Borland.** Colonel, if the change is made from the pedestal mount to the mobile mount, does that take it out of your jurisdiction as an engineering project? Do you have anything to do with the guns that are mounted on the trailers, or do you only provide emplacements for the guns mounted on pedestal mounts?

Col. **Wright.** The guns which are mounted on trailers will not require emplacements.

Mr. **Borland.** And then they will not fall within your jurisdiction?

Col. **Wright.** In all probability not, sir; but if you will remember, Gen. Black spoke to you this morning about the sound ranging equipment which is used with these guns, and the sound ranging equipment and the searchlight equipment do fall within our jurisdiction.

Gen. **Abbot.** And then, in connection with the mobile mounts, we probably would have the construction of magazines at places to be selected by the Coast Artillery.

Mr. **Borland.** Have you estimated for the five hundred and forty-one 3-inch guns that you originally contemplated having, or how many have you estimated for?

Col. **Wright.** We have that money already appropriated, sir.

Mr. **Borland.** The money was appropriated for the entire 541?

Col. **Wright.** Yes, sir.

Mr. **Borland.** How much was appropriated?

Col. **Wright.** Our estimates were $295,621. I should correct that. The insular possessions and Panama are carried as separate items.

When I say $295,621, I should say that that amount is appropriated for continental United States only.

Mr. BORLAND. How much of that money has been used?

Col. WRIGHT. Of that money we have allotted $157,451 and have unallotted $138,170.

Mr. BORLAND. Is that under this item?

Col. WRIGHT. No, sir; this money has already been appropriated.

Mr. BORLAND. But it is under this same heading?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. The $157,000 which you have allotted is for the emplacements for how many guns?

Col. WRIGHT. That has been allotted, sir, to various localities, depending on how rapidly the projects come in. The projects were drawn up originally by the department engineers and details came in at varying rates from the various districts. As the projects for the various locations came in and were approved, allotments were made. Therefore, in order to give you the number of guns, I would have to go through the various places for which these individual allotments have been made.

Mr. BORLAND. Do I understand that the $295,000, the total of these two items, would have provided emplacements for the entire 541 guns?

Col. WRIGHT. No; for the 406 guns for continental United States.

Mr. BORLAND. But you have now reduced your program to 160 guns?

Col. WRIGHT. Yes.

Mr. BORLAND. How much is actually needed to complete the emplacements for the 160 guns?

Col. WRIGHT. That is not a question I can answer definitely.

Mr. BORLAND. Can you not work that out for us?

Col. WRIGHT. I would have to go back to the department in order to get that worked out.

Gen. ABBOT. The reason for that I can make very plain. These guns were to be put in all sorts of locations, and the cost is immensely dependent upon where a gun is to go.

Mr. BORLAND. That is very true, General; but this appropriation of $295,000 was made upon a definite program for the emplacement of 406 guns.

Gen. ABBOT. Yes, sir; and it would average out in the end all right.

Mr. BORLAND. You have now modified that program and reduced the number of guns to 160, and what we want to find out, and what we ought to find out, is how much of that original appropriation is released by that change? If it is necessary to place it elsewhere, then that is a different proposition.

Gen. ABBOT. Exactly. We can give you that information by going through the individual estimates and tabulating them, but, because they are not all at the same price, we can not do that here at this hearing.

Mr. GOOD. Your original estimate must have been on the basis of $500 per emplacement per gun, or approximately that.

Col. WRIGHT. I think I can say that the unallotted balance, consisting of $138,170, will not be required for this work.

Mr. BORLAND. What do you say about the $157,451?

Col. **Wright.** Some of that, in all probability, can be taken out; but as to exactly how much, I can not say.

Mr. **Borland.** Will you run that down for us?

Col. **Wright.** Yes, sir.

Mr. **Borland.** We do not want to take away any money that you have obligated, even though you might be building some emplacements that the Ordnance Department afterwards found that they are not going to use. If you are actually under obligation we can not take that money away, but we would like to have definite information as to any work you are going to abandon because of changes in plans.

Col. **Wright.** I can get that information for you.

STATEMENT SHOWING DISPOSITION AND STATUS OF FUNDS FOR EMPLACEMENT OF 3-INCH ANTIAIRCRAFT GUNS.

The original project of the board of review for the provision of 3-inch antiaircraft guns contemplates the assignment of 406 such guns to the continental United States and 135 to the insular possessions and Panama, the total project thus comprehending 541 guns. After commencing the manufacture of 161 of these guns the Ordnance Department found itself able to construct an improved antiaircraft gun of 4.7-inch caliber on a mobile mount. It has accordingly been determined that no 3-inch antiaircraft guns will be constructed in excess of the 161 above mentioned, and that additional antiaircraft defense will be provided for by the employment of the 4.7-inch. Of the 161 3-inch guns which have been completed or are under manufacture, 130 are at present assigned to the continental United States, 29 to the insular possessions and Panama, 1 has not yet been assigned, and 1, the pilot gun, is emplaced at the Sandy Hook Proving Ground for test purposes. Four of the 130 guns assigned to the continental United States will be supplied with mobile mounts and no expenditure by the Engineer Department is necessary for their emplacement. The following table shows the localities in the continental United States in which 3-inch antiaircraft guns are to be emplaced, the amounts which have been allotted for the construction of these emplacements, the amounts already allotted which are actually required for the construction of these emplacements, and the balances of such allotments which will not be required for the construction of these emplacements.

Locality.	Amounts allotted.	Amounts actually require for construction.	Balances of allotments which will not be required.
Portland, Me	$11,430	$5,715	$5,715
Portsmouth, N. H			
Boston, Mass	23,000	7,200	15,800
New Bedford	1,600	1,600	
Narragansett Bay	10,100	3,400	6,700
Long Island Sound	8,350	3,340	5,010
New York City	61,100	18,200	42,900
Philadelphia, etc	15,050	5,400	9,650
Baltimore	3,600	3,600	
Washington	2,870	2,870	
Hampton Roads	14,000	4,900	9,100
Cape Fear	1,100	1,100	
Charleston	1,800	1,800	
Savannah			
Key West			
Tampa			
Pensacola	3,451	2,000	1,451
Mobile			
New Orleans			
Galveston			
San Diego			
Los Angeles			
San Francisco			
Puget Sound			
	157,451	61,125	96,326

A large proportion of the allotments listed in the foregoing table were made on the basis of the employment of four hundred and six 3-inch aircraft guns in the continental United States. The reduction in the number of these guns from 406 to 130 renders quite a number of these allotments excessive and makes it possible to withdraw from them the sums shown in the column headed "Balances of allotments which will not be required." To complete the project for the emplacement of 130 guns, however, it is still necessary to allot $30,000 for work in the localities to which allotments have not previously been made. It is expected that in order to provide for these allotments and for the construction of shelters, magazines, and other necessary features in connection with these emplacements the entire amount shown in the column headed "Balances of allotments which will not be required" will be needed. It appears, however, that the present unallotted balance of $138,170 will not be required and could safely be withdrawn if Congress so desires.

Mr. Slemp. I understood from your statement that you were going to put 4.7-inch guns in place of these 3-inch guns, and, therefore, the inference was that the $138,170 would be used for that work instead of the 3-inch guns.

Gen. Abbot. The Engineer Department will have no work in connection with that except possibly the construction of the magazines.

Mr. Slemp. This 3-inch gun is not the same as the 75-millimeter gun and you have not made the modifications in that which have been made in the other ordnance work.

Col. Wright. That is a question the ordnance men will have to answer.

Mr. Slemp. But the 3-inch gun and the 75-millimeter gun are about the same.

Col. Wright. Yes; but we actually have for this purpose, I think, several different models of the 3-inch gun, some for field artillery use and some on seacoast mounts.

Mr. Borland. What other work is embraced under this item that we have not touched on.

Col. Wright. There has been a certain amount of emergency work done in consequence of the war. Certain localities have been thought insufficiently protected, as a result of their greatly increased importance, and we have done emergency work in a number of different places. I may give as an instance of that that only a few days ago a project came through to put two 6-inch guns at the mouth of the Delaware River. That is the latest one, I believe. Similar work has been done in other localities, which is of a temporary nature only, not permanent battery construction work.

Mr. Borland. You have an unallotted balance there from which you can do that temporary work?

Col. Wright. Yes, sir.

Mr. Borland. How much has that emergency work amounted to during the current year, and also at what points was it done?

Col. Wright. The localities in which emergency work has been done and the cost of such work are shown in the following table:

Sachuest Neck, R. I	$5,400
Rockaway Beach and Navesink Highlands, N. Y	53,000
Capes May and Henlopen	9,000
Cape Henry and Fishermans Island, Va	72,500
Mayport, Fla	75
Los Angeles, Cal	2,000
Lake Merced, Cal	24,361
Fort Canby, Wash	66,970
Grays Harbor and Willapa Bay, Wash	42,500
Total	275,806

Mr. **Borland**. What other work, if any, has been done under this item?

Col. **Wright**. That is practically all we have done on battery construction in the United States.

Mr. **Good**. When was it decided to use a 4.7-inch antiaircraft gun?

Col. **Wright**. That matter was originally brought up by the Ordnance Department in December, 1917. That was the first intimation, as I remember, that the Ordnance Department had the 4.7-inch gun in process of development.

Mr. **Good**. During the hearings last year you proposed a 4.2-inch antiaircraft gun to take the place of the 3-inch gun. What was the reason for abandoning that theory before it was tried out, or was it tried out?

Col. **Wright**. I can not tell you about that. The changes of caliber depend on the discoveries of the Ordnance Department as to the practicability of certain constructions, and the information which we received in December was to the effect that their 4.7-inch gun was a practicable proposition.

Gen. **Barrette**. That gun was devised in order to improve on the range of the 3-inch gun. The hostile aeroplanes rise to avoid the 3-inch gun, so that the caliber of these antiaircraft guns was increased to reach airplanes at higher altitudes.

Mr. **Slemp**. What is the range of the 4.7-inch gun?

Gen. **Barrette**. I think about 17,000 yards.

Col. **Hase**. The 3-inch gun will reach a target at a height of 8,000 feet at 5,000 yards, while the 4.7-inch gun will reach a target at 2,500 meters in the air, and a maximum horizontal range of 13,000 meters.

MODERNIZING OLDER EMPLACEMENTS.

Mr. **Borland**. The next item is "for modernizing older emplacements." You had an estimate in 1918 of $102,000, and you were allowed $102,000. Will you explain what has been done with that money and what your unexpended balance is, if any?

Col. **Wright**. The available balance already allotted March 31 was $9,778.21, and the unallotted balance $55,507.81, making the total cash available $65,286.02.

Mr. **Borland**. What was done with the $40,000 that you have spent?

Col. **Wright**. The work which has been done has been almost entirely in connection with the alteration of projectile hoists, which has been made necessary by alterations in the form and size of the projectile. The Ordnance Department has developed a new form, long-pointed projectile, which has been found to possess very much better qualities than the older form, for which the projectile hoists were installed.

Mr. **Borland**. Is that what is known as the Taylor-Raymond hoist?

Col. **Wright**. That is the name of the hoist which we are at present using, and the work done with this appropriation for modernizing older emplacements has been almost entirely in connection with adapting the old hoists to carry the new projectiles.

Mr. **Borland**. At what points has that been done?

for which you appropriated the last time. We want to hold that money because the Ordnance may be able to go ahead with their work unless you take away their balance also.

Mr. BORLAND. And therefore, General, we will want to have those facts in our minds when we come to examine the Ordnance people.

Gen. ABBOT. Precisely.

Mr. BORLAND. We do not want to estimate that you have $4,500,000 on hand which you do not need when the fact is, perhaps, you have obligated or must obligate part of it.

Gen. ABBOT. We have promised the Ordnance Department emplacements for their guns. Those emplacements will cost this much money. Now, the Ordnance people have promised us guns for that many emplacements and also the carriages. They will give them when the Council of National Defense lets them get at their work. Now, what both of us want to do is to keep our money so that as soon as public policy permits it we can go ahead and we will then match together like two cogwheels.

Mr. BORLAND. And what we want to do is to make our money go as far as we can at the immediate moment?

Gen. ABBOT. That is exactly the point.

Mr. SLEMP. You do not anticipate any change in the policy of the Council of National Defense in regard to 16-inch guns within the year, do you?

Gen. ABBOT. It depends altogether on what happens across the water.

Mr. BORLAND. Let me return to this $1,567,000. That is an allotment to existing projects in course of construction?

Col. WRIGHT. That is correct, sir.

Mr. BORLAND. And how much of that, if any, would you say could safely be held in abeyance in view of existing conditions of shortage of labor, material, and so on?

Col. WRIGHT. I do not think any of that should be withdrawn, sir.

Gen. ABBOT. That is right. As to the other part, which we have not yet put into anybody's hands to start construction, if that is withdrawn, all that the committee would have to look out for would be to see that a corresponding amount of ordnance work was correspondingly postponed.

Mr. BORLAND. Yes; I understand we do not want to push them along to the point where they will have guns ready for you and you will have no emplacements for the guns.

Col. WRIGHT. Yes. The basis on which we placed our request for the withdrawal of this year's estimates was very largely the fact that we had this balance on hand which, if the Ordnance should be able to commence work, is sufficient to hold us until another bill can be passed.

Mr. GOOD. Take the emplacements at Portland, the estimate there was for $240,000, and I understood you to say that had been allotted.

Col. WRIGHT. Yes, sir.

Mr. GOOD. It is the intention to construct those emplacements?

Gen. ABBOT. They are very largely completed now. The last time I inspected the battery, the concrete was coming along quite well, and that was some time in last August or September.

Mr. GOOD. The next one you gave was Boston. where the estimate war for $930,000. What was the amount allotted?

Col. **Wright.** The estimate was $365,000 at one location and $290,000 at another, both in Boston Harbor.

Mr. **Good.** How much has been appropriated for the emplacement work at Boston?

Col. **Wright.** I can not give you that on account of the fact that the 12-inch long-range batteries were appropriated for in three different acts. The total amount appropriated for 24 guns to be emplaced in continental United States is $3,074,500.

Mr. **Good.** Yes; but have you the details there of the emplacement work at Boston?

Col. **Wright.** I can only give you our estimate.

Mr. **Good.** How much was your estimate?

Col. **Wright.** The estimate is $365,000 for one battery and $290,000 for another.

Mr. **Good.** How much of that have you allotted?

Col. **Wright.** We have allotted the money for the first battery.

Mr. **Good.** And you have not allotted the money for the second?

Col. **Wright.** No, sir.

Mr. **Good.** And do you expect to construct the first battery during the next fiscal year?

Col. **Wright.** Yes, sir.

Mr. **Good.** Do you expect to commence the second battery during the next fiscal year?

Col. **Wright.** Yes, sir.

Mr. **Good.** Will you utilize therefore the entire estimate for those two places during the next fiscal year?

Col. **Wright.** We want to utilize the entire estimate during the next fiscal year if we can. We will commence work and carry it on as far as practicable in that time. The time of construction of one of these 12-inch long-range batteries is usually more than a year.

Gen. **Abbot.** About eight months. I got four of such emplacements built in eight months but that was with night and day work.

Mr. **Good.** You think, then, that this fund should not be interfered with?

Col. **Wright.** Yes, sir.

Mr. **Good.** How about the emplacement work at New Bedford?

Col. **Wright.** That work has also been allotted for and is in progress.

Mr. **Good.** When will it be completed?

Col. **Wright.** We have not an estimate as to that.

Gen. **Abbot.** I inspected that some time in the early part of August and the foundation concrete was going in at that time.

Mr. **Good.** Will it be completed within the estimated cost?

Gen. **Abbot.** I presume it will, although the question of labor and material costs may affect it.

Mr. **Good.** What was the appropriation for the emplacements at Long Island?

Col. **Wright.** Long Island, sir, is one of the projects which we are deferring.

Mr. **Good.** What is the state of your balances there?

Col. **Wright.** No money has yet been appropriated for the construction on Long Island.

Gen. BARRETTE. We will not be able to use that money for the reason that, from some of the batteries where we intended to put in fire-control equipment, the guns have been taken for service abroad, and the fire control will not be required in those places. I do not think the guns will be back within the fiscal year, although, of course, we are not sure.

Mr. BORLAND. Are you going to use any portion of that money during the present fiscal year?

Gen. BARRETTE. Yes, sir.

Mr. BORLAND. How much?

Gen. BARRETTE. That depends on how much these gentlemen charge for the work they do.

Mr. BORLAND. They have got their $924,000 and gone with it. I am asking you about the unallotted balance?

Gen. BARRETTE. We will give them some more money because there is more work for them to do, but the total amount of work will not be what we expected when we asked for this money, because of the withdrawal of guns.

Mr. BORLAND. But we are within six weeks of the end of the fiscal year and you would know now, would you not, whether you had any work in contemplation that would use this money?

Gen. BARRETTE. It is just a question of telling how much. I am sure we will not use it all. I do not know whether we can form any accurate estimate now.

Col. BRIGHAM. No, sir; all of these fire-control projects will involve the necessity of making further allotments to the engineers, but just what the amount will be we do not know at present.

Mr. BORLAND. But the engineers say they are just about going to use up what they have on hand.

Col. WRIGHT. That is for the work they have already given us. Of course if they give us increased work we will require more money.

Mr. BORLAND. If they are going to give you increased work, that ought to be known now.

Gen. BARRETTE. We have recommended for approval, in the last two or three weeks, 15 or 20 of these fire-control projects.

Mr. BORLAND. How much money would be involved in the new work which you are assigning to the Engineer Department during the present fiscal year? Can you give us that information?

Gen. BARRETTE. No, sir; not now.

Gen. ABBOT. They can not because they will have to tell us what they want done and we will have to find out what it will cost.

Mr. BORLAND. But here is an unallotted balance of $1,726,000, and if any portion of that is to be allotted during the present fiscal year the plans are probably completed now.

Gen. ABBOT. These are not fiscal-year funds. The fund is good until expended.

Mr. GOOD. Was that estimate made on the theory, General, it would be good until expended?

Gen. ABBOT. I do not know, sir. We do not make fire-control estimates.

Mr. BORLAND. How much of the $3,147,225 which was appropriated in the deficiency act of June 15 was it intended to place under the Engineer Department for expenditure?

Gen. **Barrette.** There were 58 major-caliber batteries at $25,000 which were to be provided with fire control, and 51 intermediate batteries at $4,000, and 74 minor-caliber batteries at $3,200. Now, we have not got that itemized as between the two different departments.

Mr. **Good.** You have not the division between the Ordnance and the Engineer Department?

Gen. **Barrette.** No, sir.

Mr. **Borland.** General, the amount you have given here of the proportion between the Engineer Department, the Signal Corps and the Ordnance Department, and in addition to that the unallotted balance brings you just about up to the amount of the deficiency appropriation of $3,147,000, and that does not take into account the regular appropriation of $608,000 which you had in the annual bill?

Gen. **Barrette.** No, sir.

Mr. **Borland.** You asked for $608,796 in your estimates for 1918 and got the full amount?

Gen. **Barrette.** Yes, sir.

DETAILS OF EXPENDITURE.

(See p. 189.)

Mr. **Borland.** Have you the details of that expenditure?

Gen. **Barrette.** Engineer Department, $280,358.64; Signal Corps, $117,625.07; Ordnance Department, $210,812.50.

Mr. **Borland.** Of the amount of $280,000 allotted to the Engineer Corps, what was done with that?

Gen. **Barrette.** Construction of fire-control stations to provide horizontal base lines for batteries at Fort Michie, N. Y., $1,508; construction of fire-control stations for seventy-six 5-inch and 6-inch batteries—cost per battery, $2,500—$190,000; purchase of sites for fire-control station, Prospect Hill, Newport, $21,000.

Mr. **Borland.** Has that site been purchased?

Gen. **Barrette.** Yes, sir.

Mr. **Borland.** Have you got title?

Col. **Hase.** We have got title; yes, sir.

Gen. **Barrette** (continuing). Installing fire-control cables at Fort Wetherill, underground, $9,654; installing fire-control cable at Fort Banks and Fort Heath, Mass., $5,000; installation of post telephone system, Fort Banks, $2,100; installation of radio equipment at Fort St. Philip, La., $2,500; installation of fire-control switchboard, Fort Barry, Cal., $2,764.64; installation of fire-control cables, underground, Fort Dade, Fla., $640; installation of radio station at Fort Terry, N. Y., $1,300; increased estimate for San Pedro, Cal., it being found that the estimate for San Pedro for 1917 was too small by $26,000, $26,000; unappropriated balance of engineer estimate for 1917 for San Pedro, $17,892, which makes the total.

Mr. **Borland.** That is the total of the Engineers' allotment?

Gen. **Barrette.** Yes, sir. Signal Corps: Signal Corps equipment for seventy-six 5-inch and 6-inch batteries, $99,256; for horizontal base line for batteries at Fort Michie, $3,625.45; material for one K. W. radio set for Fort St. Philip, La., $5,060; Signal Corps material for switchboard at Fort Barry, Cal., $2,608.62; fire-control material, battery Kellogg, Fort Banks, Mass., $2,100; total, $117,625.07.

Ordnance Department: For fire control made up of the following: For new long-range 12-inch batteries: 9 plotting boards at $1,500, $13,500; 9 range boards at $275, $2,475; 9 Lewis depression position finders at $1,700, $15,300; 18 azimuth instruments at $650, $11,700; 9 wind component indicators at $50, $450; 9 deflection boards at $200, $1,800; add 25 per cent for increased cost, $11,306.25, total $56,531.25. For 5-inch and 6-inch batteries not now equipped in the United States, 53 gun plotting boards at $1,500, $79,500; 6 mortar plotting boards at $1,500, $9,000; 69 gun deflection boards at $200, $13,800; 65 gun range boards at $275, $17,875; 65 wind component indicators at $50, $3,250, total, $123,425; add 25 per cent for increased cost, $30,866.25, or a total of $210,812.50.

Mr. BORLAND. General, is all of the work which you have detailed there to be completed during this fiscal year?

Gen. BARRETTE. Yes, sir.

Mr. BORLAND. What is the status of the Engineer portion of the work?

Col. WRIGHT. I can give you the status at the principal localities. The work at Portland, Me., is completed. At Boston, Mass., it is completed except for additional stations on Outer Brewster Island. Long Island Sound it is completed except for two stations at Reservoir Hill. The additional base lines for Fort Michie and Fort Terry, of which the General spoke, involve the construction of 16 stations altogether, and the work is practically completed there.

Mr. BORLAND. Where is Fort Michie?

Col. WRIGHT. At Long Island Sound, Defenses of Eastern New York.

Gen. ABBOT. It is a small island down there.

Col. WRIGHT. The work at New York and Hampton Roads is completed. The status of the San Diego work, I think I gave you a short time ago. At Los Angeles the plans are approved, one station is practically completed, and the installation of the fire-control material at the batteries themselves have been completed. Our work at Los Angeles on the remainder of the stations is at present held up to some extent on account of the lack of sites. We are negotiating for them now and have practically completed that.

Mr. BYRNS. Do I understand that all of these batteries are now provided with provisional fire control and that these sums that Gen. Barrette has just named are for the purpose of making them standard and putting them underground; is that correct?

Gen. BARRETTE. That was the idea in asking for the large appropriation of $3,147,225, to replace the provisional installations with standard installations and to provide installations for the small batteries that we had not provided for heretofore. This sum is sufficient to provide all of our batteries with a fire-control system which would permit their fire to be efficient.

Mr. BORLAND. Mr. Byrns was speaking of the regular estimate for 1918 of $608,796.

Mr. BYRNS. Yes.

Mr. BORLAND. Was that for the purpose of providing standard fire-control equipment?

Gen. BARRETTE. No, sir; the large item of $3,147,225 was to provide all of our batteries with a fire-control system.

Mr. **Borland**. The large estimate was for the purpose of making that change?

Gen. **Barrette**. Yes, sir.

Mr. **Borland**. And the regular estimate of that year was for the purpose of installing new fire control where none existed?

Gen. **Barrette**. The major portion of that appropriation was to provide 76 5-inch and 6-inch gun batteries with a standard system of fire control.

Mr. **Borland**. Then, as far as that work is concerned, you have practically either expended the money or have obligated all of it?

Gen. **Barrette**. Yes, sir.

Mr. **Borland**. We have two estimates we are considering now, the regular estimates of $608,000 which you have just detailed to me——

Col. **Wright**. Mr. Chairman, the work which I have just detailed to you I have not kept separate as between those two estimates in the way Gen. Barrette has.

Mr. **Borland**. Altogether the items you refer to amount to $1,100,000?

Col. **Wright**. Yes, sir; that is the amount I am accounting for.

Mr. **Borland**. And how much of that $1,100,000 was expended or obligated during the current year? What I want to find out is whether there is any unobligated balance?

Col. **Wright**. From the 1st of January, 1917, to April 17, 1918, the total amount which I have as assigned to the Engineer Department is $1,131,934.60. Of that amount there was allotted $411,984.04 and unallotted $719,950.56.

Mr. **Borland**. On what date was that unallotted?

Col. **Wright**. April 17 of this year.

Mr. **Borland**. What is the condition to-day; do you know?

Col. **Wright**. No, sir; I can not give you later data than that.

Gen. **Abbot**. The information regarding allotted balances has to come from the monthly reports, and they have not come in yet from the Pacific coast.

Mr. **Borland**. It does seem, General, in view of the difficulty of getting material and labor, unless this work is absolutely pressing, the new work could probably be deferred for the present.

Gen. **Barrette**. Where we are providing fire control for existing batteries; these are not very large batteries, nothing like 16-inch guns, and it is the only protection we have. For instance, I have just gone over the fire-control projects for the nine coast defenses on the southeastern coast from Wilmington down to Galveston. Many of the batteries have no fire-control installation at all; at some the installation is provisional and does not fulfill the requirements. We are trying to provide the guns which are installed, with a communication system to permit those guns to be used effectively.

Mr. **Borland**. What size batteries are they?

Gen. **Barrette**. There are a few 12-inch and some 10-inch and some mortars, but none of them are very large batteries.

Mr. **Borland**. And, therefore, it would be a defense only against submarines.

Gen. **Barrette**. Or stray raiders; we might have a stray raider come in there and shoot up the place. We have accomplished much since this appropriation was made, and I think this additional amount should be expended to put the batteries on the basis of efficiency, prepared to repel any naval attack which might be delivered.

Mr. GOOD. They are equipped with fire control, are they not?

Gen. BARRETTE. Yes; some of them are, but many are not.

Mr. BORLAND. You have this $1,100,000 that was allotted to the Engineer Department out of these two appropriations, and you have three-quarters of it unexpended in the third quarter of the year.

Gen. BARRETTE. I can give you the reason for that.

Mr. BORLAND. It does not look as though there was very pressing need for it.

Gen. BARRETTE. The reason that it has been delayed was——

Mr. BORLAND (interposing). And then you have $1,750,000 absolutely unallotted on top of that.

Gen. BARRETTE. Yes, sir; when we began the withdrawal of seacoast guns, it was uncertain for a while just how many they were going to withdraw, so that we could not arrange for the fire control until we knew which guns were to stay. That is the reason that a good many of these fire-control projects have just gone to the Engineer Department, or gone to the General Staff, and from there they will go to the engineers.

Mr. BORLAND. Have you cut out of your program all of the 16-inch guns and all of the guns that have been removed for the purpose of being taken to France?

Gen. BARRETTE. Yes; and we have avoided spending any money on guns that were not there.

Mr. BORLAND. In spite of that you have three-quarters of the amount allowed to the Engineer Department unexpended and we are in the last quarter of the year?

Gen. BARRETTE. Yes, sir; because, as I said a moment ago, a great many of the fire-control projects were held up pending decision as to what guns were going. We will get a statement of just how much and we will submit that statement.

Mr. SLEMP. And what percentage of the work has been completed?

Gen. BARRETTE. Yes, sir.

Mr. BORLAND. I would like to have you submit a statement of what your program is with regard to this fire control.

Gen. BARRETTE. I have not that exactly.

Mr. BORLAND. That is probably in the hearings of last year.

Mr. GOOD. Not very fully.

Mr. BORLAND. Or in the deficiency hearings. I want to see your modified project. I want to see the project out of which you have cut the 16-inch guns and the guns that have gone to France.

Gen. BARRETTE. I can submit that statement. (See p. 189.)

Mr. BORLAND. You are asking in the estimate at this time for $31,000. Are you adhering to that estimate or is that one you withdraw?

Gen. BARRETTE. No, sir; the idea in putting that in is simply to inform the committee as to the use that it is proposed to make of that money. We have money, of course, as you have just seen, that we could use for that purpose if the committee authorizes it.

Mr. BORLAND. What was the specific purpose you had in view for that $31,000?

Gen. BARRETTE. The construction of a coast-defense commander's tactical station at Fort H. G. Wright, coast defenses of Long Island

Sound, $10,000; to construct a new bomb-proof plotting room at Battery Ingalls, a mortar battery at Fort McKinley, Me., $10,000; and putting underground the post telephone system at Fort Rosecrans, Cal., $11,000; a total of $31,000.

Mr. **Borland**. How about this tactical building? Is that a part of the fire-control system?

Gen. **Barrette**. Yes; it is the place where the commanding officer would have his headquarters in action. At Fort Wright, N. Y., the idea was to build a central station for his use during action.

Mr. **Byrns**. Do you need any extra authority to spend money for the purposes indicated?

Gen. **Barrette**. The point was, that we wanted to inform the committee as to the purpose that we wanted to spend this money for; we did not feel authorized to spend money that had been appropriated on an itemized presentation to the committee before; we did not feel authorized in spending that $31,000 for that purpose.

Mr. **Byrns**. Not having indicated it in your hearings?

Gen. **Barrette**. Yes.

Mr. **Good**. In the deficiency bill you estimated $450,000 for bombproofing fire-control switchboard rooms.

Gen. **Barrette**. Yes, sir; the bombproofing of those fire-control switchboard rooms was included in the act of June 15, 1917.

Mr. **Good**. What about the construction of those bombproof fire-control switchboard rooms?

Gen. **Barrette**. That is going right along.

Mr. **Good**. How about the construction of the auxiliary base-line installation at fortifications on the Pacific coast, Gulf coast, and Atlantic coast?

Gen. **Barrette**. That is going right along with the rest of this fire-control installation. These auxiliary stations are wanted for the purpose of bringing a fire on a part of the water that is not covered and that can not be covered by the existing base lines. In establishing these auxiliary stations, we simply put down a monument and mark a point and then put an azimuth instrument there for use in case of an emergency, so that we can fire on waters that could not otherwise be covered.

Mr. **Good**. Are you doing any construction work along that line now?

Gen. **Barrette**. Yes, sir.

Mr. **Good**. Is it essential that that work should be carried on?

Gen. **Barrette**. I think so; I think it should go on, because a study of these places has shown that there are some waters covered by the guns, but have no fire-control stations to get the range of the ship which is in that area; they are dead spaces.

Mr. **Good**. Where are these base lines established with reference to the fortifications?

Gen. **Barrette**. They are established to have the base line overlook the principal fields of fire of the batteries that they serve. You take a mortar battery, for example, that will fire all around. The standard base line covers the principal field of fire. Take San Francisco, for example. It covers the main channel; there are other water areas and some land areas that you want to fire on. Now, you do not install a valuable installation to cover these auxiliary areas, but you install a cheap installation, a smaller installation, which is not so expensive, and that is called an auxiliary base line.

INSTALLATION AND REPLACEMENT OF ELECTRIC-LIGHT AND POWER PLANTS IN UNITED STATES.

(See p. 44.)

Mr. Borland. For installation and replacement of electric-light and power plants at seacoast fortifications you had $110,000 in the regular appropriation bill and $1,700,000 in the deficiency act. What have you done with that money?

Col. Wright. On the 31st of March our available balances allotted were $462,992.93 and unallotted $724,004.86, making the total cash available $1,186,997.79.

Mr. Borland. That does not account for all of your cash. You had $1,800,000, while that only accounts for $1,186,000.

Col. Wright. That does not give our expenditures, and our expenditures are to be added to that.

Mr. Borland. How much have your expenditures been?

Col. Wright. I go back a little further than you do. I had on January 1, 1917, an unallotted balance of $13,590.86 from previous appropriations, and since that time you have charged me with $1,810,000. I think that checks your figures.

Mr. Borland. We did not give you any appropriation in 1917, because you had an unexpended balance.

Col. Wright. Yes, sir. My figures go back to January 1, 1917, but do not pass beyond that date.

Mr. Borland. Since then we have charged you with $1,810,000.

Col. Wright. So I have to account for $1,823,590.86.

Mr. Borland. How much have you expended?

Col. Wright. Of that amount there has been allotted $1,103,386 and there is unallotted $720,204.86. My figures will be approximate on this on account of the fact that my amounts of balances available are given as of March 31, while the figures I gave you of the total allotments were of date April 15, but they will be very close. The available balance of allotments on March 31 was $462,992.93.

Mr. Borland. There is a balance unallotted of $720,000.

Col. Wright. Yes, sir.

Mr. Borland. Have you a statement of where these projects were to which this money was allotted?

Col. Wright. Yes.

Mr. Borland. I suppose it embraces a good many items?

Col. Wright. Probably a page and a half of this book [indicating].

Electrical installations—Applications of funds since Jan. 1, 1917.

Jan. 1, 1917, unallotted balance	$13,590.86
Feb. 14, 1917, appropriated	110,000.00
June 15, 1917, appropriated (deficiency)	1,700,000.00
	1,823,590.86

ALLOTMENTS.

Portland: Installing 25 k. w. generating sets	4,400.00
Portsmouth: Fort Stark: Installation generating set at Battery Hunter	3,100.00
Boston: Installation generating sets at Forts Warren, Banks, Strong, Andrews, and Standish	10 [illegible]

Long Island Sound:		
Fort H. G. Wright: Installation generating set at Battery Butterfield	$600.00	
Fort H. G. Wright: Installation generating set at Battery Clinton	800.00	
		$1,400.00
New York: Installation generating set for mortar battery, Navesink Highlands		500.00
Delaware River: Installation generating sets at Batteries Arnold, Gibson, and Torbert		1,600.00
Potomac: Terminal huts at Forts Washington and Hunt		275.00
Hampton Roads: Installing six 25 k. w. generating sets		4,470.00
Cape Fear: Installation of three generating sets, Fort Caswell		6,200.00
Charleston: Installation 25 k. w. sets, Battery Huger		1,050.00
Tampa:		
Fort Dade: Changing motor equipment, south casemate	$125.00	
Fort Dade: Power house, Battery Burchsted	3,125.00	
		3,250.00
Mobile: Installation, 25 k. w. set, Battery Duportail		1,000.00
New Orleans: Installation of 3 generating sets, Fort St. Philip		2,773.00
Galveston, Tex.: Installation of generating sets		9,340.00
Los Angeles, Cal.:		
Fort Rosecrans: Building rooms for power plant between Batteries Wilkeson and Calef	$8,283.00	
Installing sets at mortar batteries	1,000.00	
		9,283.00
San Francisco, Cal.: Fort Funston: Installing lighting system for temporary emplacements		1,435.00
Columbia River: Power houses at Batteries Clark and Freeman and installing generating sets in each		14,000.00
Puget Sound: Battery Kinzie: Installing standard gas meter set		700.00
Office, Chief of Engineers: Salaries		3,000.00
General engineer depot:		
Purchase of 4 25 k. w. sets		2,500.00
36 Splitdorf magnetos for reserve in C. A. Districts		3,500.00
25 k. w. generating set for C. A. School, Fort Monroe		4,000.00
Purchase of 153 25 k. w. sets, spare parts, etc		920,000.00
Purchase and test of 5-k. w. generating set		1,000.00
6 25-k. w. generating sets for defenses of San Diego		47,000.00
6 25-k. w. generating sets for defenses of Los Angeles		47,000.00
		1,103,386.00
Unallotted, Apr. 15, 1918		720,204.86
Total		1,823,590.86

The unallotted balance is required to cover the completion of installations at Los Angeles and San Diego, and for the installation of approximately 119 generating sets now under order.

Mr. **Borland.** What do you propose doing with your unallotted balance? This is pretty nearly the close of the fiscal year.

Col. **Wright.** The unallotted balance is going to be used to complete our power installations at the Los Angeles and San Diego fortifications. There will be gasoline generating sets for electric power at those batteries.

Mr. **Borland.** It is to be used to complete them?

Col. **Wright.** Yes, sir.

Mr. **Borland.** Have they been begun?

Col. **Wright.** Power rooms, etc., are provided in the batteries at the time of construction; what we have still to do is to provide the machinery and put it in place. The status of those two I can give you exactly, if you wish. The project at San Diego requires six

25-kilowatt generating sets. The equipment has been ordered, but it has not been delivered. The funds have been allotted to the district officer for the installations in two of the batteries.

Mr. BORLAND. How much will it cost to complete that project?

Col. WRIGHT. I can not give you that. There was for the power house at these two batteries of which I speak an unexpended balance on March 31 of $2,463.53. Now, that allotment was only partial, as you see; it only included two of the batteries.

Mr. BORLAND. How much of the projects remains to be completed for which you have not allotted the money and for which you must still allot the money?

Col. WRIGHT. We still have the other batteries in that San Diego project.

Mr. BORLAND. How much is that?

Col. WRIGHT. The new batteries there are the two mortar batteries; they will require an electrical installation also.

Mr. BORLAND. How much will that amount to in cash, the completion of that project, over and above what you have already allotted to date?

Col. WRIGHT. I can not give you that right here, but I can insert it in the hearings if you wish.

Mr. BORLAND. I wish you would. You can not even approximate it?

Col. WRIGHT. Not right offhand; no, sir. Then there will be six sets to be installed at Los Angeles.

[NOTE.—The amount still to be allotted for the completion of the electrical installation in the coast defenses of San Diego is $13,049.]

Mr. BORLAND. How much do you expect to have to allot there to complete it?

Gen. ABBOT. The amount depends on the length of the copper cable, because one of the large expenditures is for the copper cable.

Mr. BORLAND. You had some estimate in mind when you got this money?

Col. WRIGHT. Yes, sir; certainly.

Mr. BORLAND. You have allotted and expended a portion of the money you received, and you have unallotted and unexpended $721,000. Now you say that the major part of that or perhaps all of it will have to be allotted for the completion of these two projects.

Col. WRIGHT. No, sir. You stopped me a bit too early. Those two projects will be a very small proportion of that item.

Mr. BORLAND. I thought they were the principal projects.

Col. WRIGHT. No; only a small portion.

Mr. BORLAND. What I want to get at is how much of the project you had in mind when you made this estimate in the deficiency act you have carried out, and how much of it you still expect to carry out, and what it is you still expect to carry out.

Col. WRIGHT. In order to answer that question I will have to go into the question of the supply of the material to be installed, because that is what our work actually depends on. We have made an allotment to the General Engineer Depot, our purchasing agent, for the purchase of 153 standard 25-kilowatt generating sets. These are gasoline operated. That allotment was in the neighborhood of $1,000,000—$920,000, to be exact. The Engineer Depot placed with the General Electric Co., who are the manufacturers of these sets, orders for the sets, but after the orders had been placed with them we received very large requisitions from Gen. Pershing for material of this exact nature, and inasmuch as his demands are very much more pressing than those of any of the defenses in this country we have been taking these sets as they come from the General Electric Co. and shipping them abroad instead of using them for the purpose for which the order was originally placed. The expenditure of this money, which is required for the installation of these sets, has, therefore, been held up because the sets which it was expected to install have been sent to Gen. Pershing instead of to the fortifications in which we intended to put them.

Mr. **Borland.** And, of course, charged against another appropriation.

Col. **Wright.** Yes; transferred to Engineer Operations in the Field. This appropriation for the purchase of those sets will be reimbursed from our appropriation for Engineer Operations in the Field.

Mr. **Borland.** What is meant by the term power plant? Is that a power plant for the operation of the electric lights?

Col. **Wright.** Yes, sir.

Mr. **Borland.** Solely?

Col. **Wright.** Not solely; it also operates the hoists.

Mr. **Borland.** What class of power plants are they, gasoline plans?

Col. **Wright.** Gasoline plants; yes, sir.

Gen. **Abbot.** Twenty-five kilowatt sets.

Mr. **Good.** They are all now supplied either with commercial power and light or small sets.

Col. **Wright.** These 513 were required in the various coast defenses to supplement existing power plants to take the place of old sets which had been installed at previous times, and to provide sources of reserve power. It is always our attempt in battery construction to provide at least two sources of power. In the construction of earlier emplacements we did not have the money at the time to complete our power installations, so we would provide each battery with one set, for instance, and now we are intending to complete that installation.

Mr. **Borland.** At both of those places—San Diego and San Pedro—you have commercial power available?

Gen. **Abbot.** It is alternating current. Incidentally, we have had several bad experiences in introducing alternating current into magazines.

Mr. **Borland.** You have been using it right along and this is to provide auxiliary or duplicate power?

Col. **Wright.** Yes; to make us independent of outside sources.

Mr. **Good.** General, you can take alternating current and transform it so as to get direct current, can you not?

Gen. **Abbot.** Yes; by the interposition of other machinery, except in comparatively small amperage. The mercury rectifier will not carry more than a limited number of amperes without burning up, so that to come from the alternating current to direct current it would have to go through a motor generator or something of that kind, which adds one more piece of machinery.

Mr. Good. If I recall correctly, a few years ago you were operating the plant at some of the fortifications by purchasing your power and current from the local plant.

Gen. Abbot. At a few places. The illumination for the post quarters is almost entirely bought in that way. There was a time when the posts were illuminated from the Engineer Department's central power plant, but now we are putting these 25-kilowatt sets, one or two in each battery, and then the breaking down of the commercial lines does not put any of the defenses out, and each battery is practically self-contained.

Mr. Borland. What are the prospects now of being able to place your orders for this material and, if you happen to get the material, using it for this purpose, without having to divert it abroad?

Col. Wright. Until very recently the prospects have been very poor, but the chances now are that we will be able to secure quite a number of these sets in the comparatively near future. The outlook is much better now than it has been, I should say, for at least a year past.

Mr. Borland. How are they running on the question of cost? Are they costing an increased amount by reason of the increased cost of labor and material, or are they coming within your estimates?

Col. Wright. I think they will come within the estimate. We are buying in largely increased quantities, which will give better prices.

Mr. Good. In looking over the estimates which the War Department has made to this committee for a number of years, it would appear that in 1911 you were in almost a perfect condition and did not ask anything for the installation and replacement of electric lights. In 1912 you asked for $50,000 and received it; in 1913 you asked for $50,000, but you had expended very little of the other $50,000, so we did not appropriate anything; in 1914 you asked for $50,000, in 1915 you asked for $60,000, in 1916 you asked for $60,000, and in 1917 and 1918 you asked for $110,000 each year. Now, this could not have been so very urgent or you would have asked for more money during all those years; and now, inasmuch as they are asking for this same equipment on the other side, would it not seem the part of good judgment to forego making any other installations and turn this money back into the Treasury, which you have not used, and let the equipment go where it is so badly needed?

Gen. Abbot. That is what we have done, exactly. We have let it go, and now they say they have all the supply they want.

Mr. Good. Then this $720,000 that is unallotted could be safely covered back into the Treasury?

Gen. Abbot. I should think so, without any trouble, provided we can get it again.

Col. Wright. It is obligated.

Mr. Good. No; that is unallotted. It can not be contracted for if it is unallotted. This is a free balance, as I understand it.

Mr. Borland. On the 15th of April there was $720,000 unallotted.

Gen. Abbot. We had orders out, thinking we were going to continue to send this equipment to France, and they have diminished now, and we have got to take what is under contract with the General Electric Co., and we would have to pay for it out of this fund.

Col. Wright. We have placed our orders with the General Electric Co. for this equipment with the expectation that it would be used in France. We had to be prepared to meet Gen. Pershing's requests at very short notice, and the expectation was that the sets would be purchased from "Engineer operations in the field."

Mr. **Byrns.** For the full amount of the $720,000?

Col. **Wright.** Yes; much greater than that.

Mr. **Borland.** You allotted $1,102,000. No money can be expended or even contracted except out of allotted funds. You do not contract anything out of unallotted funds?

Col. **Wright.** No, sir.

Mr. **Borland.** Now, the fact that you have made an allotment does not necessarily mean that you have expended it. It simply means that you have set it aside for a particular project?

Col. **Wright.** That is correct.

Mr. **Borland.** You had $462,000 balance unexpended on hand, and I got the impression that that was the money that was left unexpended by reason of the fact that your goods were diverted to France; but you could not have diverted to France anything out of the unallotted money, because you had not expended that or obligated it.

Col. **Wright.** If I may enter into a little explanation of that, sir——

Mr. **Borland.** That is what I want to get.

Col. **Wright.** When we place a contract with the General Electric Co. for these sets we do not specify out of what appropriation we are going to pay for those particular sets that they are going to furnish on that contract.

Mr. **Borland.** Let me stop you right there, Colonel. You do not specify what projects those sets are for, but you have allotted $1,102,000, and it is presumably out of that allotment that you have ordered these sets?

Col. **Wright.** Only partially. A very large number of the sets have also been ordered from our allotments which have been made to the engineer depot from "Engineer operations in the field," with the expectation they would be used in France.

Mr. **Good.** That is not carried in this bill.

Col. **Wright.** That is not carried in this bill at all. Now, these sets will come through, and on account of the contract requirements which we have to make with the General Electric Co. we can not stop production on an instant's notice.

Mr. **Borland.** No; but do you mean to say that, having ordered some of these sets under the project from the district engineers and some additional sets from "Engineer operations in the field" on order of Gen. Pershing, that if Gen. Pershing cancels some of his orders and you find yourselves obligated to take more sets than you want for both purposes, then you will be obliged to pay for them out of the unallotted fund; is that what you mean?

Col. **Wright.** No; but I want to be sure I am in position to pay for all the sets that I find I can use in the seacoast defenses. I do not want you to take the money away from me that I will require for that purpose.

Mr. **Good.** I understood from Col. Wright that this $720,204 was a free balance. If that is not correct, to what extent has it been obligated?

Mr. Borland. As I understand it now, if some of these sets they have ordered from the General Electric Co. are not sent to France he may have to take them in this country.

Mr. Good. Of course, his books will show to what extent each appropriation has a free balance. Tell us just to what extent this is a free balance.

Col. Wright. The status is this: I have allotted to the Engineer Depot $920,000 to buy 153 sets. Those are for seacoast-defense purposes. Up to the present time I have been unable to definitely secure delivery of all of those 153 sets on account of the fact that as fast as they came through the factory they went to Gen. Pershing instead of coming to me for fortifications use. Now, Gen. Pershing has said that he will not require these sets any longer. The prospects are that I can get my remaining sets within a comparatively short space of time, and a very large amount of this $720,000, which I have stated as an unallotted balance, I will allot, as soon as I get these sets, to the various district officers who are going to install them in the seacoast fortifications. In case you take my $720,000 I am going to have my sets in the factory, but I will not have the money to put them in the fortifications where we want them.

Mr. Borland. Did you buy those sets out of this appropriation?

Col. Wright. Yes; I have $920,000 allotted.

Mr. Borland. You have allotted the money for the sets but not for the installation?

Col. Wright. That is the idea.

Gen. Abbot. The $720,000 is to get these things installed and running.

Mr. Borland. Then, it will be necessary for you to give us the amount that will be necessary for the installation of these sets.

Col. Wright. Yes, sir.

Mr. Borland. And also give us information as to whether you will get the sets or not.

Col. Wright. All right, sir. I will have to communicate with the Engineer Depot. They are in touch with the General Electric Co. on the production schedule.

STATEMENT REGARDING THE COST OF INSTALLATION OF 25-KILOWATT GENERATING SETS, AND OF THE PROBABILITY OF OBTAINING THESE SETS FOR SEACOAST-DEFENSE PURPOSES.

Of the 153 25-kilowatt generating sets which it is planned to install for the purpose of supplying power and light in seacoast defenses, allotments have already been made for the installation of 34. The cost of installation has averaged about $5,000 per set. It is to be noted, however, that the majority of these sets were installed in fortifications in which power houses for their reception were already available.

A considerable number of the 119 sets still to be installed will require the construction of new power houses which must be provided with bomb-proof protection. The cost of labor and material is constantly rising and this is especially true with respect to the copper cables which are widely used in the installations for the transmission of power. For these reasons it is expected that the average cost of installing the remaining 119 sets will exceed the average cost of those installations for which allotment has already been made.

Assuming a figure of $6,000 for the installation of each set, the total cost of installing the 119 remaining sets would be $714,000, which approximates very closely the unallatted balance, $720,000, now on hand. It is, therefore, considered that no part of this balance is available for withdrawal.

With regard to the prospects for the supply of the 25-kilowatt generating sets for the seacoast defenses, the following information is furnished:

On May 25, 1918, the Corps of Engineers had received requisitions for a total of 504 25-kilowatt generating sets, which were urgently needed—either in France or in the United States—in connection with the prosecution of the war. Of these sets, 283 had left the factory on the date mentioned, leaving to be manufactured and shipped on the orders then on hand, 221 sets. On the date mentioned, the rate of production of these sets was approximately 40 per month, and efforts were being made at that time to increase the rate to a final figure of 80 per month. This final figure, however, can not be reached for some months to come.

From a consideration of the above figures, it appears safe to say that—in the absence of further requisitions for war needs—the demands already received will be filled in about five months, approximately, November 1, 1918. It should, therefore, be possible to commence securing sets for seacoast-defense purposes about that date.

Mr. SLEMP. I would also like some information as to the probability of securing power in some other way instead of installing separate power plants.

Col. WRIGHT. On the question of the utilization of commercial power?

Mr. SLEMP. Yes; if it is not too much trouble I would like very much to have that information.

NOTE.—The advantages and disadvantages of the use of commercial power and central power plants in seacoast defenses was brought out in the hearings on the fortifications appropriation bill of 1915, pages 50–52, and in the hearings on the same bill for 1916, pp. 107–111.

Mr. GOOD. Colonel, have you information now as to the cost of installation per set of these 153 sets?

Col. WRIGHT. No, sir; but I can get you the average cost and I will bring that information to-morrow morning. I do not know that I can give you definite information as to every one of these 153 sets.

Mr. GOOD. Of course not.

TUESDAY, MAY 14, 1918.

CAPE HENRY.

(See pp. 5, 7, 10, 11.)

CONSTRUCTION OF WHARF AND RAILROAD.

Mr. SLEMP. Please state just what has been done at Cape Henry in regard to the construction of the wharf and railroad and the status of the work generally.

Col. WRIGHT. An attempt was made to construct the wharf by contract and bids were invited. These were received in May, 1917. The lowest bid which was received was in the neighborhood of $230,000, and exceeded the estimate which had been made by over $100,000. The Chief of Engineers directed the rejection of all bids on the wharf and took up with the district officer and with the Coast Artillery authorities the provision of some smaller structure for use as a landing for motor boats and smaller craft. He desired to limit and reduce the size of the wharf in some way. After considerable discussion it was determined that the Government itself could not do the construction work for less than the bids received, and that nothing we could get for a smaller price would serve our purposes there. In view of the fact that work was generaly dragging at Cape Henry, it was decided to put by the construction of the wharf for the time being.

Mr. SLEMP. In other words, all of the work should go along simultaneously?

Col. WRIGHT. Yes, sir.

Mr. SLEMP. Does the same statement apply to the building of the railroad?

Col. WRIGHT. No, sir. You are referring particularly, I take it, to the Norfolk Southern?

Mr. SLEMP. Yes.

Col. WRIGHT. That track removal has been completed and the Norfolk Southern trains are now running over the relocated lines. The old line, which formerly ran through the battery sites, has been abandoned by the railroad and turned over to the Government.

Mr. SLEMP. Does this now line give you all the transportation facilities you need for material, and so on?

Col. WRIGHT. This new line is the Norfolk Southern. In addition to that we will have to build a construction railroad to transport our material from the wharf, at which it will be delivered, to the battery sites and to other sites on the smaller parcels at Fort Story. on which the fire-control structures and mine structures are to be built.

Mr. SLEMP. All that was done on that has been to get the right of way.

Col. WRIGHT. The right of way has been cleared and a certain amount of grading has been done in connection with the construction of the railroad.

Mr. SLEMP. What percentage?

Col. WRIGHT. About 10 per cent between parcel E and parcel A and the road from parcel A to the site of the wharf has been surfaced, which amounts to practically completing the grading up to 1,300 feet of the wharf site.

TUESDAY, MAY 14, 1918.

INSTALLATION AND REPLACEMENT OF ELECTRIC LIGHT AND POWER PLANTS AT SEACOAST FORTIFICATIONS IN UNITED STATES.

(See p. 36.)

Mr. BORLAND. When we closed last night we were discussing this item for the installation and replacement of electric light and power plants at seacoast fortifications; and it appeared that of the total amount you had on hand, including the regular appropriation of 1918, the appropriation contained in the deficiency act, and the unexpended balance of the previous year, which amounted to $1,823,000, you had allotted $1,102,000 to projects that were recommended by the district engineers and there was $721,000 unallotted. I have not that quite clearly in my mind. Did the allotment to the district engineers include the sets, as you call them, and their emplacement, or include only the sets? Did not the recommendation or estimate of the district engineers include the whole of the project at the particular place where the recommendation was made?

Col. Wright. In order to explain that I shall have to go into the entire process of securing and installing these sets. Our purchasing agency is the general engineer depot, located here in Washington. That agency conducts the negotiations with the manufacturers for the procurement of the sets; and our allotments, which are made to the general engineer depot, cover only the purchase of the sets. After these sets have been procured they are shipped by the general engineer depot to the localities in which they are to be installed. Those positions are, of course, scattered all over the United States and the insular possessions, and the allotments for the installation of the sets are made to the various district engineers within whose districts the installations are to be made. So that there are two separate points to be considered: First, the procurement of the sets; and, second, their installation.

Mr. Borland. Then the estimate of the district engineers for the installation is not made until after you have procured the sets?

Col. Wright. It is separate from the procurement of the sets.

Mr. Borland. Then this unallotted balance of $721,000 must be applied in part, at least, to this installation?

Col. Wright. Yes, sir.

Mr. Borland. If you proceed with it?

Col. Wright. Yes, sir.

Gen. Abbot. And if we do not, we must pay storage on the sets, and care for them, so that it is better to install them than to keep them in storage.

Mr. Borland. When do you estimate you will have those sets and be ready for this installation estimate?

Col. Wright. In all probability those sets can be secured, under the present status of Gen. Pershing's requisitions, within a comparatively short time. As I stated yesterday, Gen. Pershing's requisitions called for a very large production of these sets. We made arrangements accordingly to provide the sets for Gen. Pershing and have been diverting to his use a number of sets which had previously been ordered with the idea of installing them in the seacoast fortifications. In other words, we accepted delayed delivery of the fortification sets. Gen. Pershing has recently made very large reductions in his requisitions and it is impossible for us to immediately readjust our production to his decreased requirements. The result will be that more sets will be produced in the near future than will fill Gen. Pershing's requisitions, as modified, and those sets we will apply to this seacoast defense work.

Mr. Borland. Can you give us any idea as to how many sets that will throw on your hands for the use in the seacoat defenses?

Col. Wright. We think that will give us the full amount which we have figured on.

Mr. Borland. One hundred and fifty-three sets?

Col. Wright. Yes, sir.

Mr. Borland. How much will it cost for the installation of these sets?

Col. Wright. I tried to get last night an average figure on that and about as close as I could get to it—it varies very much in the different localities—was $5,000 per set.

Mr. **Borland**. At $5,000 per sent that would take up your three-quarters of a million dollars that you have unexpended?

Col. **Wright**. Yes, sir.

(In this connection see statement, p. 42.)

Mr. **Borland**. How rapidly can that work be done?

Col. **Wright**. That work can be done practically as rapidly as we can secure the sets, because the sets are going in at fortifications all over the United States and there is no great amount of congestion at any particular place.

Mr. **Borland**. You want the committee to understand, therefore, that you have ordered and contracted for, and deliveries practically promised, 153 sets, and that those sets will be available to you and will not be sent to Gen. Pershing, and that it will take the remainder of this unallotted amount to install them.

Col. **Wright**. With the present status of Gen. Pershing's requisitions I think it is entirely safe to say that a few sets have already been delivered.

Mr. **Borland**. So there will be none of this unallotted amount that ought to be withdrawn?

Col. **Wright**. No, sir.

Mr. **Borland**. You should have all of that available for this particular work?

Col. **Wright**. We should. In that connection I should like to insert a correction of a figure which I gave you yesterday with regard to the cost of the 25-kilowatt sets. I made a statement that the rise which would naturally be expected in the cost of these sets, on account of increases in labor and material which have taken place within the last two or three years, was almost entirely compensated for by the fact that we were purchasing in larger quantities, and that, therefore, the unit costs of the sets were about the same. I investigated that further and I find that was not correct. The price which was paid for those sets as long ago as 1914 was in the neighborhood of $3,600 per set, and I find that our price at the present time is about $4,700 per set. That rise has taken place within the time which has intervened between 1914 and the present.

Mr. **Borland**. You say that the Government has gotten some advantage because of your larger orders?

Col. **Wright**. I think we have; yes, sir. Had it not been for our purchasing in larger quantities the rise would probably have been considerably more than it has been.

Mr. **Borland**. Yet the price is $4,700 per set notwithstanding——

Col. **Wright** (interposing). Notwithstanding the fact of the increased purchases; yes, sir.

Mr. **Borland**. The item we have been discussing more or less runs into the succeeding item for the purchase and installation of searchlights for seacoast defenses. Does the item for the installation and replacement of electric light and power plants at seacoast fortifications refer to the use of electricity for searchlights or simply for the lighting of the platforms?

Col. **Wright**. Simply for the lighting of the platforms and the operation of the ammunition hoists, and in some instances motors on the carriages.

Mr. **Borland**. So that item does not run into the searchlight item at all.

Col. WRIGHT. The sets for the operation of the searchlights are purchased from the searchlight appropriation.

Mr. BORLAND. This item for the installation and replacement of electric light and power plants at seacoast fortifications is simply to make you independent of the commercial supply of electricity? It is simply to give you an independent electrical plant at each one of these seacoast defenses?

Col. WRIGHT. To some extent it is that, and also to reinforce the plants which we already have.

Mr. BORLAND. When you have expended the amount given you in the deficiency act and in the regular acts will you have equipped all of the fortifications with these independent power plants?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. That will complete them, will it?

Col. WRIGHT. Yes, sir; at least in continental United States.

Mr. BORLAND. And will it give you, then, an independent power plant even at places where you are now using commercial power?

Col. WRIGHT. I am not familiar with the exact conditions at every one of the coast forts, but I can say offhand that the places at which we are using commercial power are very few. In some cases there are central power plants at the posts, which are Government owned and operated, and in cases where those central plants are installed at posts the battery utilities are always connected up to them, but in addition to that we want to have our source of power at the battery also.

Mr. BORLAND. So you have this independent plant at the batteries even though you have a central power plant at the post?

Col. WRIGHT. Which is Government-owned; yes, sir.

Gen. ABBOTT. An illustration of that is Fort Wadsworth, where we have a central power plant capable of supplying light and power to all the batteries, but each battery has its reserve set, or will have when this is completed, and those batteries are connected in such a way that if the central power plant is not in action—because it takes some time to get up steam—and a fleet comes in we can light the central power plant from any one of these battery plants, thus enabling them to get up steam and at the same time partly light the battery; then when the central power plant is in action we have the full illumination for the whole.

Mr. BORLAND. I assume the necessity for all of those plants was gone into at the time the hearings were had on the original estimate?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. The only question involved now is whether you are going to spend and can spend the amount that was appropriated.

Col. WRIGHT. Unless Gen. Pershing gives us very material changes in the information which we have from him at present we will be able to spend all of that money in the coming fiscal year.

PURCHASE AND INSTALLATION OF SEARCHLIGHTS IN UNITED STATES.

(See p. 58.)

Mr. BORLAND. Taking up the purchase and installation of searchlights for seacoast defenses, you had in the deficiency act $5,900,000, and in the act of 1918 $250,000. What was done with that $6,000,000?

Col. WRIGHT. Taking first the regular appropriation act of February 14, 1917, the available balance of allotments on March 31 was

$54,431.30. That was the allotted balance; the unallotted balance was $134,515.73. That makes a total of $188,947.03.

Mr. BORLAND. That leaves $62.000——

Col. WRIGHT (interposing). Which was expended.

Mr. BORLAND. Has any of that unallotted balance been allotted since March 31, or have you anything showing that?

Col. WRIGHT. I can bring it all down as far as April 18 from another statement.

Mr. BORLAND. What was the condition of the unallotted balance on April 18?

Col. WRIGHT. On April 18 the unallotted balance remaining from the balance on hand January 1, 1917, the act of February 14, 1917. and the funds returned from prior allotments was $151,772.60.

Mr. BORLAND. What, if any, plans have you for the use of that $151,000?

Col. WRIGHT. That $151,000 is to be used for the completion of the projects at San Diego and Los Angeles. At San Diego an allotment has been made for the construction of two power houses and two searchlight shelters, and two searchlights at San Diego are installed. These power houses and searchlight shelters will take care of two more, and we have the installation of two lights still to provide for, and also the procurement of the lights themselves—all of the operating machinery and the projectors.

Mr. BORLAND. Colonel, where do you get your power for the operation of the searchlights?

Col. WRIGHT. That is provided by the 25-kilowatt sets of the same type we have previously discussed.

Mr. BORLAND. Has each searchlight its own independent power plant?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. And that is what you call a set?

Col. WRIGHT. We have to provide at the rate of one set for each searchlight. A searchlight when in operation will require very nearly the complete output of one of our 25-kilowatt generating sets.

Mr. BORLAND. And the 25-kilowatt generating set is operated by gasoline?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. Where was the allotted and expended amount used out of this appropriation?

Col. WRIGHT. At San Diego, or the entire amount?

Mr. BORLAND. The entire amount of the allotted and expended amount of this appropriation; where was that used?

Col. WRIGHT. The principal items were allotted to the engineer depot for the purchase of equipment.

Mr. BORLAND. To be used at what points?

Col. WRIGHT. There were a number of mirrors bought, sixty 60-inch mirrors and eighteen 36-inch mirrors, which are used for a reserve stock; a plane searchlight mirror was purchased for certain experimental work which was being done at Fort Monroe; twenty 60-inch lights were purchased; and equipment and cable was also purchased by the engineer depot. These made up the principal items. It is very frequently necessary to operate these searchlights with very long cable connections between the power house and the lights, and that cable in the present state of the market for copper is one of our principal items of expenditure. These were the largest items. In addition to that, other large items were at Narragansett Bay for the installation of two searchlights; at New York for the installation of a 36-inch light at Fort Lafayette, and for the mounting of a searchlight on a railroad car at Fort Hancock.

Other large items were the installation at Norfolk, $4,650, most of which went for emergency searchlights at Cape Henry and Fisherman's Island, and the allotment at San Diego for the construction of power houses and searchlight shelters, to which I have already referred in the statement of available balances.

Mr. Borland. What do you call the power house for the searchlights?

Col. Wright. The power house is the concealed shelter in which the generating sets for the searchlights are housed and maintained, and the cables, of course, lead from that source of power to the lights themselves and are carried underground.

Mr. Borland. Do you have a power house for each searchlight?

Col. Wright. That depends on the nature of the installation. In some cases it is possible to group the sets for several searchlights in one house. I have in mind Fort Frank, in the Philippine Islands, in which the generating sets for three searchlights are located in one structure; but in some cases, on account of the nature of the installation, it is necessary to provide individual power houses.

Mr. Borland. When your searchlight is mounted on a railroad car, is your generating set mounted with it, or is the set in some power house and connected with it by cable?

Col. Wright. It will have to be mounted on the car with the light. I may say in that connection that the installations which have been made on railroad cars thus far have been more or less experimental. We have at present under construction a light on a railroad mount provided with an elevating tower which will raise the searchlight to an elevation of 33 feet above the rail over which the railroad car travels. That is the best attempt we have yet made at what I would call a real railroad mount for a searchlight. The installations which have been used thus far have merely consisted in adapting material which was at hand to making a searchlight portable; but the one that we have in hand now is a real attempt at establishing a type of portable railroad searchlight.

Mr. Borland. And a pilot car of that kind has been constructed?

Col. Wright. It is being constructed now, and we expect to get it in August.

Mr. Borland. How much space does one of these generators occupy?

Col. Wright. The 25-kilowatt set alone?

Mr. Borland. Yes.

Col. Wright. The space, I should say, is about 4½ feet by 10 feet in actual floor area.

Gen. Abbot. That does not include the radiator and its motor.

Mr. Borland. In many cases they can be installed in the casemate of the fortification?

Gen. Abbot. Yes, sir; in many cases that is done. Where the light is near enough they go in the same room with the other 25-kilowatt sets, but generally the lights are not used so near the guns as to make that possible.

Mr. BORLAND. Colonel, what is the history of this deficiency appropriation of $5,900,000? What do you intend to do with it, and what has been done with it?

Col. WRIGHT. The principal item which it was expected to cover with that deficiency estimate was the completion of existing searchlight projects in the United States. Those projects were lacking a great many lights.

Mr. BORLAND. And you expected to complete them all with that appropriation, did you?

Col. WRIGHT. Yes, sir; and the modernizing of the lights. It appears in the hearings on the regular bill of last year that we had at that time under consideration the adoption of the Sperry high-intensity light for fortification purposes to replace the pure carbon arc light which had been used up to that time. The comparative tests were made at Fort Monroe under the Coast Artillery Board between the Sperry light and the light using the pure carbon arc and also between the Sperry light and the Beck light, which is another form of high-intensity searchlight. As a result of those tests the Coast Artillery Board recommended that we adopt as standard the Sperry high-intensity light, and that has been done. All new lights which will be installed in the defenses will be of the Sperry high-intensity type; and we also have in hand large items for the changing over of the lights already in the service to use the Sperry mechanism.

Gen. ABBOT. The Sperry mechanism is the lamp that goes in the searchlight and it involves very few structural changes.

Col. WRIGHT. It is possible to make the alterations from the pure carbon arc light to the Sperry light at an expenditure of approximately $2,000 per light.

Mr. BORLAND. And you purpose to change all of our searchlights to the Sperry type?

Col. WRIGHT. Yes, sir; and one more point——

Mr. BORLAND. Is that a 60-inch projector?

Col. WRIGHT. I am just about to take that up, sir. We have at the present time in use in the coast defenses a large number of lights of less than 60-inch diameter, and it has been decided that we will withdraw those lights and replace them with the 60-inch lights. So that the end toward which we are striving is to have the coast defense installations made up entirely of the 60-inch Sperry lights.

Mr. BORLAND. Is the Sperry light a patented article?

Col. WRIGHT. I think it is; yes, sir.

Mr. BORLAND. Is it an American patent or a foreign patent?

Col. WRIGHT. An American patent. The inventor is Mr. Elmer A. Sperry, of Brooklyn.

Mr. BORLAND. Do we own the patent or do we pay a royalty on the patent?

Col. WRIGHT. Neither.

Mr. BORLAND. It seems to be owned by the General Electric Co.

Col. WRIGHT. No, sir; it is not owned by the General Electric Co. That is exactly the point of the matter.

Mr. BORLAND. The General Electric Co. had developed the Beck searchlight?

Col. Wright. Yes, sir; which was tried out in competition with the Sperry light.

Mr. Borland. The Sperry light, you say, was patented by Mr. Sperry, of Brooklyn?

Col. Wright. Yes, sir.

Mr. Borland. Do you know whether the Government owns that patent or whether we pay a royalty on it?

Col. Wright. Mr. Sperry owns the patent and we make our purchases from Mr. Sperry. He owns the constructing facilities.

Mr. Borland. The Beck light, which is used by the Navy, does not run higher than 36 inches in diameter.

Col. Wright. The Navy does not use any lights of greater diameter than 36 inches on account of the fact that they can not handle the big lights on battleships, because their space is limited.

Mr. Borland. And the Beck light was invented by a foreigner?

Col. Wright. Yes, sir; Mr. Beck, of Germany.

Mr. Borland. And is owned and has been developed by the General Electric Co.?

Col. Wright. Yes, sir; the American rights to that patent were secured by the General Electric Co.

Mr. Good. What was the name of the old light?

Col. Wright. It had no particular name, sir. It was a pure carbon arc light. The mechanism of the lamp was developed by the General Electric Co., and our projectors were secured from them.

Mr. Borland. Colonel, how far have you proceeded with the program of installing these 60-inch Sperry lights in all of the fortifications?

Col. Wright. We have not been able to get very far with it on account of the fact that the lights, as fast as they were supplied by the manufacturers, were sent abroad to fill Gen. Pershing's requisitions, and we have been using only a very few of the lights that have come through the factory thus far for coast defense purposes. We have only been installing them, in fact, in response to very urgent requests from the Chief of Coast Artillery in positions in which he considered their use very necessary for coast defense purposes, and in general practically all lights which have come through have been sent to Gen. Pershing.

(See inserted statement regarding coast-defense lights, p. 53.)

Mr. Borland. What is the condition now of Gen. Pershing's requisitions?

Col. Wright. We expect to fill all requisitions which Gen. Pershing now has with us by the 1st of October. He has requisitioned a total of 255 lights, and we expect to have them shipped by that time. Subsequent to that time we are hoping to get some lights for coast-defense purposes and for antiaircraft use.

Mr. Borland. Have you got there the state of your balances with the deficiency appropriation?

Col. Wright. Yes, sir.

Mr. Borland. What was the expended amount and what was the allotted amount and the unexpended amount?

Col. Wright. The total allotments up to April 15 were $3,155,291.45. The unallotted balance at that date was $2,744,708.55.

Mr. Slemp. Colonel, will you place in the record when Gen. Pershing made his first requisition for searchlights, and to what extent?

Col. **Wright**. The first mention of searchlight equipment by Gen. Pershing, I think, was about September, 1917.

Mr. **Slemp**. That was within one month after the signing of the contract for these Sperry searchlights.

Note.—The first information of any value regarding Gen. Pershing's requirements for searchlights was received about July 28, 1917.

Col. **Wright**. Yes, sir. The first definite statement of his exact requirements, which were a total of 255 lights, was in November, 1917, and we have since been producing on a schedule which he set for us by information given at that time. The agreements which were made in August, 1917, provided for the division of the producing facilities of the country with regard to searchlights between ourselves and the Navy. Of course, the Navy must also be considered, and it happens that at the present time there are only two companies in the United States which are producing searchlights to any great extent, the General Electric Co. and the Sperry Gyroscope Co. There is one other company, the Carlisle & Finch, which has made some searchlights, but their searchlights have been, I think, of comparatively small sizes, and I do not know that they have produced any of the 60-inch projectors, which are the ones that we require.

Mr. **Slemp**. Was the delay from 1916 until August, 1917, in signing contracts with these companies a normal delay? Do you usually take that much time in getting contracts for your department?

Col. **Wright**. No, sir; ordinarily not.

Mr. **Slemp**. What was the occasion for this special delay?

Col. **Wright**. In view of the information which is contained in the hearings here, I am not willing to admit now that that great a delay occurred, because the testimony given in last year's hearings indicates that at the time of the hearings, December 9, 1916, the question as between the Sperry and the Beck light had not been determined.

(See inserted statement regarding coast-defense lights, p. 53.)

Mr. **Slemp**. When was that determined?

Col. **Wright**. I have not got that information.

Gen. **Abbot**. The Beck Light was delivered for test in December, according to the hearings of last year, under date of December 9, at page 36, the next to the last paragraph; and on page 37, the third paragraph, there is some more information along that same line.

Mr. **Borland**. Colonel, as I understand it, you have been sending these searchlights to Gen. Pershing to the exclusion of the use of them by the Coast Artillery?

Col. **Wright**. To the practical exclusion; yes, sir.

Mr. **Borland**. And you have been able to meet Gen. Pershing's requisitions?

Col. **Wright**. I would not say that we have been able to meet them; no, sir. He wants the lights faster than we can get them through production. There is a difficulty in getting quantity production started. I dare say that point has been brought to your attention in connection with other things. When we have once got lights into production, we can bring them through at a rate equal to his demand, but there is a delay in getting the full strength of our program developed.

Mr. **Sisson**. Gen. Pershing only needs the lights as he gets his forces over there.

Col. **Wright**. The distribution of lights depends——

Mr. **Sisson** (interposing). Unless he is furnishing some for the allied forces, for his own forces he would not need his lights until he got his forces?

Gen. **Abbot**. We have actually shipped more searchlight men than we have equipment for, many times over, and they are now in France, and they are calling for lights to enable our men to operate them there where they are needed at the present time.

Mr. **Borland**. Under what appropriation are those searchlights sent?

Col. **Wright**. Engineer operations in the field.

Gen. **Abbot**. And they reimburse this appropriation, of course.

Mr. **Good**. Colonel, do I understand you are now furnishing or attempting to furnish the requisitions of Gen. Pershing in France and also to equip these various places according to the plans laid out by the board?

Col. **Wright**. No, sir; we have practically ceased furnishing searchlights to the coast defenses and are concentrating our efforts on filling Gen. Pershing's demands.

Mr. **Good**. What is the plan in the future? If Gen. Pershing's demands are not as great in the future as they have been in the past you propose, then, to place orders with the General Electric Co. for new searchlights for the coast defenses as planned?

Col. **Wright**. Yes, sir.

Mr. **Borland**. You said, did you not, that you would finish filling Gen. Pershing's requisitions by the 1st of October?

Col. **Wright**. By next October; yes, sir.

Mr. **Borland**. And you will then begin to use the searchlights for the coast defenses?

Col. **Wright**. That is what we hope to do; yes, sir.

Mr. **Good**. The project required how many searchlights for the various fortified places?

Col. **Wright**. We have allotted for the purchase for fortification purposes of 101 60-inch lights from this urgent deficiency appropriation.

Mr. **Good**. Yes; but my question was how many the projects required.

Col. **Wright**. As to that, I should not like to make a definite statement, because searchlight projects have been in the course of revision for some time past.

Mr. **Good**. Last year Col. Winslow put in the record a statement of the project requirements based on figures prepared by the office of the chief of Coast Artillery. That statement appeared in the previous hearings and had been brought down to date here, and I think, Colonel, that it should be brought down to date at the present time, showing the present condition of affairs.

Col. **Wright**. I should like to insert such a statement in the hearings.

STATUS OF PROJECTORS—ALL HARBORS IN UNITED STATES.

Note.—The statement of project requirements below is based on figures prepared by the Coast Artillery Division, and, in the case of harbors where definite searchlight schemes have not been adopted, is understood to be based on the assignment adopted by the Taft Board of two searchlights to a battle commander and one illuminating light to a fire commander, together with mine lights.

Locality.	Provided.					Project requires.		Yet to be supplied.	
	24 inches.	30 inches.	36 inches.		60 inches.	60 inches.		60 inches.	
			F.	P.		F.	P.	F.	P.
Kennebec River	....	1	....	....	....	2	....	2	....
Portland	....	2	1	....	8	13	....	10	....
Portsmouth	1	....	1	1	....	4	1	4	1
Del. Bay, Boston	2	....	4	....	8	14	....	6	....
New Bedford	1	....	....	1	1	4	....	3	....
Narragansett Bay	3	2	3	....	2	3	6	1	6
New London	....	....	....	....	14	14	....	....	....
Eastern New York	....	1	1	....	4	7	....	7	....
South New York	....	1	3	....	10	15	....	8	....
Delaware	....	2	....	....	1	2	4	1	4
Baltimore	1	....	2	....	....	2	4	2	4
Potomac	....	2	....	....	1	3	....	3	....
Hampton Roads	1	1	3	....	5	11	....	8	....
Cape Henry	....	....	....	....	4	6	....	5	....
Cape Fear	1	....	1	....	1	4	....	3	....
Charleston	....	1	....	1	1	5	2	4	2
Savannah	1	....	....	1	1	3	2	2	2
Key West	....	1	....	1	1	6	....	5	....
Tampa	....	....	....	1	1	6	1	5	1
Pensacola	....	....	2	1	1	9	....	9	....
Mobile	1	1	....	....	1	7	....	6	....
New Orleans	....	....	....	1	....	....	4	....	4
Galveston	....	....	1	....	1	6	6	5	6
San Diego	....	1	1	....	2	8	....	6	....
Los Angeles	....	....	....	1	....	....	6	....	6
San Francisco	....	2	1	....	9	15	1	6	1
Columbia	....	4	....	1	4	10	....	6	....
Puget Sound	....	2	....	2	14	18	....	4	....
Coast Artillery School	1	....	....	3	2	....	....	....	....
Washington Barracks	5	4	....	....	1	....	....	....	....
	18	28	24	15	98	197	37	121	37

NOTE.—The number of searchlights yet to be supplied is arrived at by deducting the number of lights on hand from the number required by the project. The apparent discrepancies which appear at several localities in the above statement are due to the fact that some of the searchlights on hand are of obsolete types, which are not suitable for use in the future.

Mr. GOOD. If I have correctly footed the figures, they provide for 144 60-inch lights and 70 36-inch lights. You have requisitions from Gen. Pershing for 275 searchlights.

Col. WRIGHT. Two hundred and fifty-five.

Mr. GOOD. Suppose the war should end within the next year and those searchlights are in good condition. Are you going ahead and buy searchlights for all of these fortified places? And, if so, we will then practically have a duplication of these searchlights and no use for them.

Col. WRIGHT. If the war should end within a comparatively short time—two or three months—or if the war should end shortly after we get our lights over to Gen. Pershing, we would in all probability have a duplication; but the wear on searchlights in France is very great indeed, and we are proceeding upon the idea—which, I think, will be borne out by the facts in the case—that not very much of the equipment which we send to France is ever going to come back.

Mr. GOOD. The reason for the question was whether or not, in view of the uncertainty in that regard and the probability that a great many of these searchlights may come back in a condition suitable for use, and in view also of the great demand for funds at this time, this project, so far as searchlights are concerned at the places mentioned in this report, could be postponed temporarily.

Gen. ABBOT. I can answer that, I think, very satisfactorily. We are sending abroad searchlights in quite a different shape from what they must be for seacoast use. For field use the pointing and the elevation of the searchlight is done in a very crude and very rapid manner, because the refinements of electrical control from a distance are not utilizable, and you can not keep the lights with distant control in order when they are being transported over rought roads and when they are liable to serve at all sorts of places away from machine shops. For the coast-artillery lights it is absolutely necessary to have the lights directed from the artillery commanding officer's distant observation post, and they are turned in azimuth and elevated electrically. If we did bring the foreign lights back, we would have a great deal of money to spend in order to get the 60-inch lights returned from service in the field into shape to receive the more complicated mechanism which is necessary in the seacoast projector and its attachments.

Mr. GOOD. Your power is the same, is it not?

Gen. ABBOT. Yes; the power is the same.

Mr. GOOD. And your searchlight is the same in all of its essential features.

Gen. ABBOT. Except in its direction and in the movement of the lamp and the arc.

Mr. GOOD. But those are very minor matters.

Gen. ABBOT. They will run into dollars; into very large sums.

Mr. GOOD. The changes must have been very rapidly made in order to effect deliveries.

Gen. ABBOT. The changes in the present case are omissions.

Mr. GOOD. Then, all that would be necessary would simply be to supply those parts that you have not been supplying, if the order had not been changed and the searchlights sent to France instead of to these fortified places, and-all you would have to do then would be to buy the spare parts that were not bought before?

Gen. ABBOT. And to replace the parts that have been smashed, ruined, and put out of shape in France. I am very much afraid your optimism about the shape those lights are going to come back in will not be borne out.

Mr. GOOD. That is possibly true and I have no opinion with regard to that. I was only asking the question as to whether or not, in view of the fact that we are sending a good many over there, quite a number may come back in fairly good condition, and we are sending over more of the 60-inch lights by about 100 than all of the projects in the United States require, so that there is a bare possibility that enough will come back in good condition to supply these projects.

Mr. SLEMP. What is the normal life of one of those searchlights?

Gen. ABBOT. They last well when they are mounted on permanent mounts and are in these searchlight shelters, such as we use in the coast defenses, but it is a very different thing when they are used in the field.

Mr. SLEMP. How many years do you figure they will last?

Gen. ABBOT. We have 60-inch searchlights in service that I know of that have been running satisfactorily certainly for 10 years.

Mr. SLEMP. Then, why should you think that the wear and tear over there could be so abnormal as to reduce their life down to six months?

Gen. ABBOT. A chronometer in an observatory will run for 35 or 40 years at a perfectly constant rate and will be in perfect order, but if you put that chronometer in a wagon and carry it around it will last about 15 minutes and then will not run at all. It is the same way with anything that is as necessarily complicated as these seacoast searchlights, with their glass mirrors and more or less complicated mechanisms; they get out of shape.

Mr. SLEMP. Have you conducted any experiments which have shown the correctness of your theory?

Gen. ABBOT. The war has not lasted long enough to show how badly they are going to damage our searchlights.

Mr. SLEMP. So that your statement is more a matter of speculation than any conclusion from experience.

Gen. ABBOT. I think it is largely a conclusion from what we know about the conditions under which these lights are operated.

Mr. BORLAND. I understood Gen. Black to say yesterday that the present use of these searchlights is for the purpose of spotting aviators, and that as soon as they are spotted they attempt to come right down the beam and put the searchlight out of business.

Gen. ABBOT. Yes; and when they have located the beam, and as soon as they get in range, they begin to use their automatic rifles, because, as you know, they are an adjunct of the aeroplanes. As soon as they can see that light they begin to shoot at it.

Mr. BORLAND. And they make that beam their first objective.

Gen. ABBOT. Yes.

Mr. BORLAND. And they try to put that searchlight out of business?

Gen. ABBOT. Yes, sir; and if they do they secure the cover of darkness and then they can operate as they please.

Mr. BORLAND. I presume that Gen. Pershing, in making his requisitions, has included a number to replace any that might be put out of commission.

Gen. ABBOT. I presume so.

Mr. BORLAND. He has done that with reference to field artillery and unquestionably he has done the same thing as to searchlights—he has requisitioned a larger number for the very purpose of having a reserve supply on hand to replace the wastage.

Gen. ABBOT. Yes. Then, there is the possibility of some of our searchlights being left behind in the same way that thousands of the English guns have been left behind.

Mr. BORLAND. I take it that if any should come back from France we could find some way to use them here.

Gen. ABBOT. Yes, sir.

Mr. GOOD. According to this report you had searchlights at all of the fortified places in 1916 except Kennebec River, Cape Henry, and New Orleans, and at Cape Henry you really have no use for searchlights because you have no armament there.

Col. WRIGHT. There is temporary armament there, sir, and there are temporary lights there at the present time.

Mr. GOOD. Have you any temporary searchlights at Kennebec River?

Col. WRIGHT. I think there is no installation there.

Col. **Hase.** A 36-inch light was sent up from Portland.

Gen. **Abbot.** At Rockaway Beach there is temporary armament, and there are temporary searchlights there in the same way.

Mr. **Good.** They are what you call the old type of searchlights?

Col. **Wright.** Yes; they have been taken from other places.

Mr. **Good.** What expense is involved in changing from the old type to the new Sperry type?

Col. **Wright.** Approximately $2,000.

Mr. **Good.** And the cost of a new light is about $5,000?

Col. **Wright.** The new Sperry light will cost between $7,000 and $8,000.

Mr. **Borland.** I caught the allotted balance of that deficiency appropriation but I did not get the unallotted balance.

Col. **Wright.** $2,744,708.55. That would total up to the entire amount.

Mr. **Borland.** How much have you expended of the allotted balance?

Col. **Wright.** My data, unfortunately, is all lumped. The available balance of allotments is $1,284,981.15.

Mr. **Borland.** That is the unexpended balance of the allotted amount?

Col. **Wright.** Yes, sir.

Mr. **Borland.** Of the amount that you have actually expended, I understood you to say that it has been expended in some cases for searchlights that have gone to France and for which you expect to be reimbursed from some other appropriation, or has that amount been expended on fortifications? I am not clear about that, because I understood you to say you had not started in on the fortifications program.

Col. **Wright.** The amount that has been expended on the fortifications is comparatively small.

Mr. **Borland.** That is the way I understood it, and practically all that you have expended has been expended on searchlights that have been sent to Gen. Pershing?

Col. **Wright.** Yes, sir; very nearly all of the amount has been expended in that way; but, as I say, it is reimbursable.

Mr. **Borland.** Then it will practically be the 1st of October before you begin any material expenditure on searchlights for fortifications in this country?

Col. **Wright.** Yes, sir. We can not get the lights to spend the money on before that time.

Mr. **Borland.** In view of that fact, are you going to use all of that deficiency amount within the next fiscal year?

Col. **Wright.** In order to bring that before you I have had the engineer depot give me an idea of what they can get from the United States in the way of searchlights, and they have estimated that between the 1st of October and the 1st of July, 1919, they can, by further developing the searchlight productive capacity of the country, secure 625 lights.

Mr. **Borland.** But that is more than our program.

Col. **Wright.** That program is just for coast defense, sir. When Gen. Black was here yesterday morning he spoke to you concerning antiaircraft lights. Those antiaircraft lights are not in the coast-defense program, but are used for the defense of localities which are removed from the coast defenses.

Mr. GOOD. Have you an item in the Army bill providing for searchlights to be used in the field?

Col. WRIGHT. The searchlights are purchased from the appropriation for engineer operations in the field, and we have an estimate of about $1,000,000,000 under that appropriation title.

Mr. GOOD. Then why was anything paid out of this appropriation for searchlights to be used in the field?

Col. WRIGHT. It was not finally paid out of this. Orders had been placed on the basis of this appropriation, and when the lights came through we were ready by that time to divert them to France, and the appropriation is to be reimbursed by a transfer of funds.

PURCHASE AND INSTALLATION OF SEARCHLIGHTS FOR SEACOAST DEFENSES. INCLUDING SEARCHLIGHTS FOR ANTIAIRCRAFT DEFENSES AND ACCESSORIES.

(See p. 47.)

Mr. BORLAND. You have a new item of searchlights for defensive purposes, $1,475,000.

Col. WRIGHT. Yes, sir.

Mr. BORLAND. You have stricken out this original item and inserted a new one with enlarged language? That is what that amounts to.

Col. WRIGHT. Yes, sir.

Mr. BORLAND. Your new item is "For purchase and installation of searchlights for seacoast defenses, including searchlights for antiaircraft defenses and accessories, $1,475,000."

Col. WRIGHT. Yes, sir.

Mr. BORLAND. Then we must assume that this $1,475,000 item is a continuation of the item for the purchase and installation of searchlights for seacoast defenses?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. And you are starting out with your entire deficiency appropriation on hand?

Col. WRIGHT. Yes, sir; the deficiency appropriation was made in part for the purchase of lights for coast-defense purposes. It was also made in part for the purchase of antiaircraft searchlights. The unallotted balance which I gave you was $2,744,000, which we expect to spend in the following way: The $744,000 will be used for the installation of the seacoast-defense lights, which we have not hitherto been able to purchase. The money for the purpose is already allotted, but has not been expended for the reason that the lights are not available. The $2,000,000 was for the purchase of antiaircraft lights.

Mr. BORLAND. And then you have——

Col. WRIGHT (interposing). I have an additional item of $1,475,000.

Mr. BORLAND. You also have the money which is to come back to you from the field item in the Army bill.

Col. WRIGHT. Yes, sir.

Mr. BORLAND. Although it appears in this statement as an allotted amount, yet, as a matter of fact, it is a reimbursable amount, because you did not use that amount for searchlights at the coast defenses.

Col. Wright. Yes, sir; likewise we have not the searchlights.

Mr. Borland. But that leaves you with the money.

Col. Wright. Yes, sir; but without any of the searchlights.

Mr. Borland. How do you estimate that with practically all of your $5,900,000 on hand—because that is exactly what the situation is——

Col. Wright. That is the situation; yes.

Mr. Borland. And with no prospect of getting searchlights for seacoast purposes until after the 1st of October, how are you going to use the full amount carried in the deficiency act and which you have on hand and also this $1,475,000 of your new estimate?

Col. Wright. The amount allotted for the purchase of these coast-defense lights I would like to consider as available, because, as a matter of fact, it has not been spent. The lights have gone to Gen. Pershing and we have gotten the money back for them. That will make me responsible for the entire $5,900,000 with which to purchase lights. The productive capacity of the country, as I stated a moment ago, we expect to be in the neighborhood of 625 lights between the 1st of October and the 1st of July. That is, of course, a rather indefinite figure, because, in order to push the productive capacity of the country to those figures, we must uncover new sources of supply; we can not do it with the two sources which we are employing at the present time. Of those 625 lights we have made a tentative allotment of 225 lights for antiaircraft purposes for the defense of cities and utilities.

Mr. Borland. Before you pass that, you say that you have not now in sight enough capacity to produce the 625 lights?

Col. Wright. No, sir.

Mr. Borland. Do you reasonably expect that the necessary capacity will be developed within the current year?

Col. Wright. We think we can do it; yes, sir. The way it will have to be done will be to adapt the machine shops of firms possessing machine shops which heretofore have not manufactured searchlight projectors—the barrel mechanism, etc.—to the manufacture of projectors, and we will devote the entire facilities of the Sperry Co. to the manufacture of lamp mechanisms only. Most of the fine work in projector construction, I may say, comes in the lamp mechanism. The Sperry people are manufacturing lamps on a large scale at the present time, and by devoting their entire facilities to the manufacture of lamps we are hoping to be able to provide enough lamps for a considerably increased number of projectors. The construction of projectors is not a matter which requires the precision, nicety, or experience that is necessary in the production of the lamps, and we therefore expect that we can adapt machine shops which have previously not constructed projectors to the construction of projectors, whereas they would not be able to construct the lamps. In that manner we hope to be able to raise the production to the figure of 625, which I gave you.

Gen. Abbot. And in case Bausch & Lomb can not keep up the supply of glass mirrors, we apparently have a chance to expand the mirror production so as to meet the expected expansion in projector and lamp production.

Mr. Borland. Then, you put your maximum available production at 625 lights?

Col. Wright. Yes, sir.

Mr. Borland. And you have made a tentative allotment of the use which you expect to make of them?

Col. Wright. Yes, sir.

Mr. Borland. What is that?

Col. Wright. The tentative allotment contemplated 225 lights for antiaircraft defense of the large cities and utilities, which Gen. Black mentioned to you yesterday morning. Those 225 lights, as was brought out in connection with the antiaircraft-gun question yesterday, will have to be made portable in order to accompany portable guns, which I think we mentioned, and, estimating on the basis of portable searchlight outfits for those 225 lights, we reached a total cost for them of $3,475,000. The urgent deficiency act of June 15, 1917, contained an item of $2,000,000 for the purchase of antiaircraft lights.

Mr. Borland. And you have allotted that much?

Col. Wright. No, sir; it was not allotted, but that was the basis on which the appropriation was made. In order to procure these 225 antiaircraft lights we have submitted the supplemental estimate, which you have here, in the sum of $1,475,000, the total being $3,475,000, which is the amount of our figure for these 225 lights for antiaircraft defense.

Mr. Borland. The appropriation which is carried in the Army bill for engineering operations in the field is available for the purchase of searchlights?

Col. Wright. Yes, sir; for field use.

Mr. Borland. Is that confined to field use abroad? That might mean field use here.

Gen. Abbot. It depends on where the fighting is, I should say.

Col. Wright. I do not know the exact terms in which that is made.

Mr. Borland. Would that appropriation be available under its legal construction for these 225 lights, or any part of them, that you expect to use for the defense of industrial plants in this country?

Gen. Abbot. Not as we have interpreted it.

Mr. Borland. Then that is not a duplication nor is it an appropriation that is consolidated with this, and you expect to exceed that appropriation for field operations?

Gen. Abbot. For operations in Europe, or, possibly, some other place.

Col. Wright. And also operations in this country which may directly affect the operations in Europe.

Mr. Borland. The only time when you would need these searchlights to accompany the antiaircraft guns in this country for the protection of industrial centers and military depots, and so on, would be in the event that the enemy was within striking distance.

Col. Wright. Yes, sir.

Mr. Borland. That is the condition upon which you would need them, and the only condition?

Col. Wright. That is the only time we would need them; yes, sir.

Mr. Borland. Now, suppose the enemy were within striking distance; then, would that be filed operations that you are using those searchlights for or not?

Gen. Abbot. Your logic is good.

Col. **Wright.** That seems a reasonable supposition.

Mr. **Borland.** I do not know where you draw the line.

Col. **Wright.** I do not know, exactly, where the line would be drawn. I presume that would be a matter for the comptroller.

Mr. **Borland.** It is based on the possibility of the enemy being within striking distance of these places?

Col. **Wright.** Yes, sir.

Mr. **Borland.** Now, if the enemy does not strike us on this side, you do not need them?

Col. **Wright.** That is the idea, exactly.

Mr. **Good.** Colonel, the 225 searchlights you propose to purchase through this estimate will be of the same character that you except to use at our seacoast fortifications?

Col. **Wright.** No, sir; they will be of the same character as those that we are sending to Gen. Pershing at the present time for field use.

Mr. **Good.** After the war is over, it is not intended to fortify every industrial plant that you propose to fortify now?

Col. **Wright.** By no means.

Mr. **Good.** Then why not postpone the purchase and installation of searchlights provided here in your deficiency appropriation, where you got $5,900,000, and then after the war, if we do not get the searchlight back from France, take the 225 and add to them this extra equipment or the extra parts that you have referred to and put them at our principal fortifications?

Col. **Wright.** That can be done, sir. It is a question entirely of the amount of protection you gentlemen are willing to have.

Mr. **Good.** We already have searchlights at all of our principal fortifications.

Col. **Wright.** Most of them; yes, sir.

Gen. **Abbott.** But not a complete installation for their needs at the present time by a large amount.

Mr. **Borland.** The appropriation which you have in the Army bill for engineer operations in the field is made upon the basis only of Gen. Pershing's requisitions. You are not estimating for anything in that item for use on this side?

Col. **Wright.** That is my impression.

Gen. **Abbott.** That is the way we have interpreted it.

Mr. **Borland.** Now, is that the fact?

Gen. **Abbot.** Except to this extent, that some of the funds for engineer operations in the field are actually applied to operations needed in training our troops for service over there. This is military work directly in connection with the fighting there, for our troops have got to learn how in the first place. To train a man in the use of road-making machinery, for instance, is a proper charge against the same appropriation—engineer operations in the field.

Mr. **Borland.** But we are talking about searchlights.

Gen. **Abbot.** In searchlights we are training our men at Washington Barracks, and I have some 16 lights working there every night. They are not in France, but they are paid for out of engineer operations in the field. They will be shipped over to France if they are needed there more than they are here for training, but we keep enough on hand so that when I ship searchlight troops they will know what the lights are like when they get over there. Pershing has found he can not use the smaller sizes of searchlights that he thought he could at first. I am using those small sizes for the instruction of troops, because the mechanism is so similar that if they know how to handle one of our 24-inch searchlights they can certainly handle a 36-inch light. I have only one 36-inch light at Washington Barracks, and I am not going to get any more of them. I am not keeping any of the 60-inch lights to train the troops with, because they are urgently needed in France.

Mr. BORLAND. I just wanted to be sure that the estimates for the Army bill for engineer operations in the field, so far as they applied to searchlights, were confined to Gen. Pershing's requirements.

Col. WRIGHT. Yes, sir; I can say definitely that there is not a duplication in the estimates. As to whether the comptroller would decide that the appropriations were interchangeably applicable, I am not prepared to state; but the estimates have not been duplicated.

Gen. ABBOT. And we are not spending it so as to duplicate it.

Mr. GOOD. Has there been any change in the assignment of the Taft Board of two searchlights to a battle commander?

Gen. BARRETTE. No, sir; there has been very little chance. There has been a revision of the searchlight projects, and an effort made to reduce the number, so that there would be no searchlights installed under this $5,900,000 that were not necessary in that project. That is the only change that has been made.

Mr. GOOD. And two to a battle commander is left, as established by the Taft Board?

Gen. BARRETTE. Yes, sir; the principle is the same.

Mr. GOOD. Colonel, can you tell how many are needed to finish the project?

Col. WRIGHT. I can insert such a statement in the hearings, although I have not get it with me this morning.

Mr. GOOD. Will you also in the hearings bring the statement that is found on pages 38 and 39 of the hearings last year down to date?

Col. WRIGHT. Yes, sir; I will do both of those things.

[This statement appears on p. 53.]

PROTECTION, PRESERVATION, AND REPAIR OF FORTIFICATIONS IN THE UNITED STATES.

TORPEDO STRUCTURES.

Mr. BORLAND. "For protection, preservation, and repair of fortifications for which there may be no special appropriation available, and for structures for the torpedo defense of the United States and for maintaining channels for access to torpedo wharves, $300,000."

You got $250,000 in the regular bill. What is the condition of this appropriation?

Col. WRIGHT. The available balance of allotments March 31 was $103,772.78, and the unallotted balance was $51,279.37.

Mr. BORLAND. What work has been done with the allotted portion of the appropriation?

Col. WRIGHT. The work under these preservation and repair appropriations, Mr. Borland, consists of a great number of very small items. I can mention the various localities, if you wish, and the total amount of money that has been spent at each place. Perhaps that will be the best way to handle it.

Mr. BORLAND. Are there any substantial items in that?

Col. WRIGHT. There are no very large items.

Mr. BORLAND. That amount runs just about what it has run for several years?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. Now, as to the unallotted balance, are you going to use that during the current year?

Col. WRIGHT. I think we almost certainly will; yes, sir.

Mr. BORLAND. Will you not find the shortage of labor and the high price of material curtails your work in that direction?

Col. WRIGHT. That is true, sir; but the work which is done with this appropriation is work which ought to be done more or less irrespective of the conditions as regards labor and material, because upon its being done depends the maintenance in an efficient condition of the fortifications which we already have. While there may be some question as to the advisability of new construction, there has never been considered to be very much as to the advisability of keeping our old structures in an efficient condition.

Gen. ABBOT. Not only that, but a good deal of this money is expended in supplying paint, cement, and other items of that kind for use by the troops stationed at these points. They do a great deal of the painting and the upkeep, and we pay for materials as well as for labor.

Mr. BORLAND. What would you say as to the probability of your using the $51,000 of unallotted balance this year?

Col. WRIGHT. I should say we would almost certainly use it, and I should not be surprised if we were to run over.

Mr. BORLAND. Apparently you are well within your appropriation?

Col. WRIGHT. Yes, sir; on the 31st of March, but the time from the 1st of April on is always the time at which the major portion of this preservation and repair work is done. Of course, during the winter working conditions are unfavorable and as little of it is done at that time as possible. In the spring the Coast Artillery usually hold their target practice and they wish all their armament and equipment in the very best condition. Then, especially in the northern part of the United States, there is usually damage which has been done during the winter months which it is necessary to repair, so that we find that the greater part of our expenditures for preservation and repair work comes in the spring of the year. Some of our allotments which are out for that purpose have become exhausted already. I received a request last night from the district engineer at New London for an allotment of $2,500 additional to those which had already been made to him for preservation and repair work, stating that his balance was completely exhausted, with certain urgent items still to be done.

Mr. BYRNS. Why will you need $50,000 more for next year than you have this year, especially when it appears you have $51,279.37 unallotted and only six weeks, practically, remaining of the current year?

Col. WRIGHT. That was the condition on the 31st of March. I have 12 weeks to go.

Mr. BYRNS. Why will you need $50,000 more next year than you had during this year?

Col. **Wright.** For one reason, there will be an increased number of fortifications to take care of during the next year, and while some of these fortifications are new fortifications on which the maintenance will not be very heavy, nevertheless it will amount to something. In addition to that, there have been quite a few temporary installations which have been made during the past year, and those will also require maintenance, and a temporary installation, from its very nature, will usually run high on the maintenance cost as compared with a permanent structure. I think, in addition to that, Gen. Abbot will tell you that experience in the past has shown that we have practically always had difficulty in keeping within the appropriations which have been made for us for preservation and repair work.

Gen. **Abbot.** I would like to say right here that I have been in local charge of actual work for the preservation and repair of fortifications for the last eight years, and I think the Coast Artillery will testify to the fact that I have had to refuse time and again to do work that ought to be done in the interest of economy and in the interest of the proper looks of the defenses of the United States because I was entirely out of funds and the Chief of Engineers could not give them to me. At every one of our fortifications you will find the same thing going on. The engineer officer is writing the Artillery, "I am sorry, but I can not get the money to do this work and we will have to put it over until next year." We do not overspend the money you gave us, but in a great many cases we do not keep our seacoast defenses in the condition I would like to see them. There is ironwork that ought to be painted, but gets rusty; there is concrete which a little patching would save from injury by winter frost, but it goes unpatched and then you have a big job of repairs to do. The prevention of leakage through the loading platforms if undertaken when it first begins is very cheap, but if you let it go some years, as is so frequently done, water gets through and rusts the trolley system underneath. Then you have a big bill to pay, and it is much better to keep things in shape than to let them run down.

Mr. **Borland.** I want to call your attention, General, in that connection to the statement accompanying this item, which shows the amount expended under this head in 1917. The amount was $188,000. In contrasting that with the items of this present estimate of $300,000, you will see that the amount expended for equipment and material in 1917 was $54,450, and you have estimated $109,000 this year, or just double the amount you expended in 1917. Of course there has been an advance in the cost of material of about 25 per cent, so that this is quite a large advance.

Gen. **Abbot.** These estimates are based in detail upon the investigation made in each battery all over the United States by people who are located there. Of course, the Chief of Engineers does not know what is absolutely necessary and what is not, but the estimates are made by officers who are there on the ground and can see, and that difference represents the present estimate of what should be done to keep the plant in good working order.

Mr. **Good.** What is the value of the structure that this appropriation is intended to keep in shape?

Gen. **Abbot.** I was coming to that very point, because that is an argument I used to use before this committee 10 or 12 years ago. It is a very small percentage of the total investment in these plants, which is applied for upkeep, and I think you will find it very much less than the average factory puts into its upkeep.

Mr. **Borland.** And it ought to be.

Gen. **Abbot.** And this is in the nature of a factory, but when we are using our guns we are using a tool that produces a good deal more local destruction than when you are using a turning lathe.

Mr. **Borland.** It ought to be much less than a factory from the nature of the structure and from the nature of its use.

Gen. **Abbot.** Yes; but iron rusts very fast, especially in the salt air and when it is not in use.

PREPARATIONS OF PLANS FOR FORTIFICATIONS.

Mr. **Borland.** "For preparation of plans for fortifications and other works of defense, $25,000."

You are asking for $25,000, which is the amount you have had for the last two years. Has your work of preparing plans increased, or has it not, to some extent, come to and end?

Col. **Wright.** The plans which are being prepared are land-defense plans at the various fortifications and also the plans for 16-inch emplacements for howitzers.

Mr. **Borland.** Those plans have been substantially made, have they not?

Col. **Wright.** We are still working on certain details, notably the ammunition service, which has given more trouble than anything else. But I may say with regard to the plans that the Engineer Department will be entirely willing to have that estimate cut out. We have funds on hand which will serve for the entire year.

Mr. **Borland.** How much have you on hand?

Col. **Wright.** We have $28,425.61 on hand.

Mr. **Borland.** Accumulated from these items?

Gen. **Abbot.** They are accumulated from previous appropriations.

Col. **Wright.** In partial explanation of that I should like to say that the expenses of the Board of Engineers, which is the body which prepares our typical plans for fortification purposes, have heretofore been borne from the various battery-construction appropriations, proportionate amounts being charged. But inasmuch as the work of the board is practically entirely concerned with the preparation of plans for these purposes, we now wish to cease charging the expenses against various battery-construction appropriations and provide for the board from this plans appropriation. Those expenses of the board will give us an item of $12,000.

Mr. **Borland.** What board is this?

Col. **Wright.** The Board of Engineers at New York City.

Mr. **Borland.** You have been charging a proportion of the expenses against each battery-construction item?

Col. **Wright.** Yes, sir.

Mr. **Borland.** What is wrong with that plan? Why not do that?

Col. **Wright.** There is not any particular reason, sir, except that it would simplify the bookkeeping and make it easier to account for the appropriations if we can charge all the expenses of the board against the plans appropriation, since all of their work is concerned with the preparation of these plans.

Gen. ABBOT. It is a better description of their work than is the other.

Mr. BORLAND. What is their total annual expense?

Col. WRIGHT. We are estimating $12,000.

Mr. BORLAND. And you want to change it against this fund?

Col. WRIGHT. Against this appropriation; yes; instead of against a number of others. If that is satisfactory to the committee, we will not charge any of the expenses against the battery-construction funds.

Mr. BORLAND. What have you been using this fund for?

Col. WRIGHT. This has been used principally in the preparation of plans for the land defense of the various fortified harbors, and only a portion of the Board of Engineers' expense has been paid from it. For example, I have here a statement of the expenses of the board for 1918, in which I find that the total expenses were about $12,000, of which $6,000 was taken from this plans appropriation and the remaining $6,000 was taken from battery-construction money, partly in the United States, partly in Panama, and partly in the insular possessions.

Gen. ABBOT. It makes better bookkeeping to charge the planning work to the item for plans than to try to divide it as well as we can among the different construction items that are built in accordance with those plans.

Mr. BORLAND. I assumed, without knowing the history of this, that the purpose of this particular appropriation was to provide for plans which might not or did not necessarily materialize in any particular construction work. Where you have construction work which is actually carried out, of course, it is simple enough to charge the drafting of the plans to the general cost of the construction, but it is necessary sometimes to have a little overhead account for the preparation of plans which may be altered, which may be abandoned or may not materialize in one way or another, and it was that class of plan preparation that I supposed was taken care of by this amount.

Col. WRIGHT. When we are about to construct a new battery or a battery for the emplacement of a gun of a new caliber the preparation of type plans for the emplacement is intrusted to the Board of Engineers. After the type plans have been made by the Board of Engineers they are sent out to the various district officers in whose districts batteries of this general nature are to be constructed. Then it is the duty of the district officers to take these type plans which have been developed by the Board of Engineers and adapt them to the particular local features of the site on which they are to place the batteries. So there is, I think, a distinct division of labor in those two things. The plans developed by the Board of Engineers are general in their nature, the district engineers take those plans and adapt them to a particular site.

Mr. BORLAND. And it is necessary to have a fund on hand for that purpose?

Col. WRIGHT. Yes.

MAINTENANCE AND REPAIR OF SEARCHLIGHTS, ELECTRIC LIGHTS, AND POWER EQUIPMENT IN UNITED STATES.

Mr. **Borland.** The next item is for maintenance and repair of searchlights and electric light and power equipment for the coast fortifications, etc. That is, the maintenance item corresponding to the construction item we had before us a little while ago, is it not?

Col. **Wright.** Yes, sir.

Mr. **Borland.** You had $40,000 in the regular bill of 1918?

Col. **Wright.** Yes, sir.

Mr. **Borland.** What is the condition of your balances under that appropriation?

Col. **Wright.** On the 31st of March, 1918, we were obligated to the extent of $846.98 in excess of the appropriation. In the act of March 28 of this present year we secured an additional appropriation of $60,000 for this purpose.

Mr. **Byrns.** Did you have any funds at the beginning of the fiscal year?

Col. **Wright.** We had $10,898 on the 1st of January, 1917.

Mr. **Borland.** With the $60,000 you obtained in the deficiency bill—has that become available as yet?

Col. **Wright.** Yes, sir; that became available immediately.

Mr. **Borland.** What effect, if any, will that have upon your present estimate of $40,000?

Col. **Wright.** As showing how rapidly that is likely to go I may say that on April 19, 1918, only three weeks after that deficiency appropriation became available, allotments aggregating nearly $25,000 had been made from it.

Mr. **Borland.** Will you use the $60,000 and will you need in addition to that the $40,000 estimated for the fiscal year 1919?

Col. **Wright.** I think in all probability I will, sir. My total allotments since January 1, 1917, have been nearly $77,000.

Mr. **Borland.** What is the cause of the extraordinary increase in this maintenance item?

Col. **Wright.** One cause which I think has had a very great deal to do with it has been the largely increased operation of the searchlights and the generating sets for operating the searchlights. Since the war first began in practically all the harbors of the United States searchlights—at least one or two searchlights—are kept in operation during the night. In the Philippine Islands, when I was there last year, there were four lights kept constantly at work every night, and I think that is the case in almost all the harbors of the United States. Of course, that entails an expenditure for the carbons which are used in the searchlights and involves also very much increased wear on the generating sets, and on the searchlights themselves; then the lubricating oil, which is also purchased by us, will be used up at a much greater rate. I fancy that in addition to that particular item all of the seacoast defenses have been operating their equipment at a greater rate than is ordinary in peace times, because the drills have been much more frequent. Their experienced personnel has been taken away to quite a considerable extent for use with the heavy mobile artillery in France, and the seacoast defenses are largely manned at the present time with troops which have been secured from the draft or from the National Guard Coast Artillery organizations. In order to bring those troops to a proper stage of efficiency it has been necessary to hold drills more frequently and to continue them longer.

Gen. ABBOT. And repairs, through the use of untrained men, are heavier than with trained operators.

Mr. GOOD. Included in the deficiency item of $5,900,000 there was, as I understood the testimony of Col. Winslow, the plan of purchasing carbons for a year's supply, and also additional lenses. I was wondering whether these two items, in that respect, are kept separate.

Col. WRIGHT. Spare mirrors have never been bought from the appropriation which we are now considering; carbons are bought from it, but the mirrors being a large item, would not ordinarily be bought from it. This fund is intended more for running supplies and would include a large number of comparatively small items.

Mr. GOOD. If, then, the increased cost is chargeable to the constant use of the searchlights the estimate you have made for 1919 is altogether too small, it seems to me.

Col. WRIGHT. Yes, sir; it would have been too small were it not for the fact that we secured the $60,000 in the deficiency act of March 28, 1918. Having received that additional amount I will probably be able to run into next year with a balance.

Mr. GOOD. Was any part of this maintenance fund used for the repair of searchlights sent abroad?

Col. WRIGHT. No, sir; this is seacoast defense money.

MINING CASEMATES, CABLE GALLERIES, ETC., FOR SUBMARINE MINES IN THE UNITED STATES.

Mr. BORLAND. The next item is, "For construction of mining casemates, cable galleries, torpedo storehouses, cable tanks, and other structures necessary for the operation, preservation, and care of submarine mines and their accessories, and for providing channels for access to torpedo wharves, $260,000." You had $150,000 in the last bill, and were granted $500,000 in the deficiency bill.

Col. WRIGHT. Yes, sir.

Mr. BORLAND. A total of $650,000.

Col. WRIGHT. Yes, sir.

Mr. BORLAND. What is the condition of your balances under that appropriation?

Col. WRIGHT. We had in addition to that an unallotted balance on January 1, 1917, of $148,883.11, and there was returned from prior allotments $250, so that the total amount of money which we have had available since January 1, 1917, has been $799,133.11. Of that amount there was an unallotted balance on April 19 of $437,314.40, the remainder having been allotted.

Mr. BORLAND. That gives you, allotted, $360,000?

Col. WRIGHT. Approximately; yes, sir.

Mr. BORLAND. Has that all been expended?

Col. WRIGHT. No, sir. Of that amount there was available on March 31 approximately $223,000.

Mr. BORLAND. What is your prospect of being able to spend that allotted balance? Do you expect to do that?

Col. WRIGHT. The allotted balance we should be able to spend. The projects for which allotments have been made are all proceeding, and I can give you the status of practically all of them. At Portland, Me., there was an allotment of $10,750 for the construction of cable tanks. That work is well along and almost completed. At Boston there were two mining casemates to be bomb-proofed; at one location the work is 50 per cent completed and at the other they had not been able to commence work at the time this report was made, although the allotment had been made. At New Bedford a new casemate was being constructed and was partially completed. At Narragansett Bay a cable-terminal hut was constructed; also an extension to the mine wharf and the extension of the lighting of the mine building and the wharf. At Long Island Sound there was the construction of a cable tank, the modification of loading rooms, and the rearrangement of tracks, as well as the construction of a combined mining casemate and fire-control switchboard room and a cable-terminal hut. At Wilmington, Del., work was in process in bomb-proofing the mining casemate. At Cape Henry the excavation was completed for the construction of a mining casemate. At Hampton Roads the bomb-proofing of the mining casemate was in progress. At Charleston and also at Savannah a cable-terminal hut was being constructed. At Tampa construction was in progress on a boathouse; a planting wharf; tramway; loading, drying, and dynamite rooms. At Pensacola a combined casemate and switchboard room had been allotted for, but the work had not been commenced. At Mobile a storehouse, tramway, casemate, and loading room had been completed. At San Diego the work of bomb-proofing the mining casemate has been practically completed. At Los Angeles the work of constructing a casemate and storing magazine has been practically completed, but other structures at Los Angeles, which are also included in the mine project, have not been commenced because the site for these structures is on certain reclaimed ground which is being filled. At the Columbia River work was done in lighting the mine wharf and the construction of mining casemates.

Mr. BYRNS. To what date are you referring?

Col. WRIGHT. March 31, 1918. That is the work that has been done. It is expected with the money we still have to proceed with bombproofing mining casemates in various parts of the country.

Mr. BORLAND. You say money you still have. You mean of your allotted amounts?

Col. WRIGHT. No, sir; unallotted.

Mr. BORLAND. I was asking you first as to your expenditure of the allotted funds. You say you can complete the work embraced under the allotted projects.

Col. WRIGHT. Yes; with my allotted funds I can complete them.

Mr. BORLAND. Now, as to the unallotted funds, $437,000.

Col. WRIGHT. With those funds it is expected to proceed with the provision of bombproof protection for other mining casemates in the defenses. This bombproof protection is made necessary by the fact that modern long-range fire will give a much greater angle of fall to the projectiles than has previously been the case and will make necessary the provision of overhead cover. The development of airplane attack has also made that necessary. In proceeding with this construction of mining casemates and bombproofing we are, as far as possible, using rooms in existing batteries which are already bombproof to a greater or less extent, but on account of the difficulties of condensation which are usually encountered in the older batteries. that has not proven practicable in very many cases, and we have generally had to make new plans for mining casemates. In those new plans we have usually tried to join the casemates with the fire-control switchboard room inasmuch as both of them have to be placed under bombproof protection, thereby reducing the cost of the separate items.

Mr. BORLAND. How many of our seacoast fortifications are now equipped with bombproof mining casemates?

Col. WRIGHT. Practically only those which I have just mentioned. and I have mentioned only a few where the work has been completed.

Mr. BORLAND. This year is the first year you have begun that work?

Col. WRIGHT. Yes.

Mr. BORLAND. How far should this amount of money carry you toward the completion of those projects?

Col. WRIGHT. We expect that it will complete the bombproofing of casemates in continental United States.

Mr. BORLAND. That is this unallotted balance of $437,000?

Col. WRIGHT. Yes, sir; that is all with reference to casemates already existing.

Mr. BORLAND. And will it take all of the $437,000?

Col. WRIGHT. Yes, sir; and we may run over some. A rough estimate has been submitted that the total cost of that work will be in the neighborhood of $500,000. but, of course, that can not be definitely stated until the estimates are in for all of the localities.

Mr. BORLAND. Within what time do you think that work can be completed?

Col. WRIGHT. I should say we ought certainly to be able to do it within the next fiscal year. Projects are coming in right along from the district officers, and we are making allotments for the commencement of such work.

Mr. BORLAND. This has been done by force account, has it not?

Col. WRIGHT. Yes, sir; this work has been done by hired labor.

Mr. BORLAND. Do you find any difficulty in securing labor at this time?

Col. WRIGHT. We had a request recently from the district engineer at Wilmington, Del., who wishes to bombproof the mining casemate at one of the forts in his district by contract, but we have not yet had time to consider that matter thoroughly. The principal reason which he gave for that request was that it was extremely difficult for him to secure labor to do the work on account of the fact that there was very considerable construction going on near the site of the work, and the prices paid for labor on that construction were such that it was almost out of the question for us to meet them with the funds at our disposal.

Mr. BORLAND. What are the facts as to this new estimate you have of $260,000?

Col. WRIGHT. The $260,000 is made up of one item of $110,000 to complete the mine installation at Cape Henry. The casemate, you will remember, had been allotted for and the excavation had been completed; $110,000 is required to complete the mine projects. The individual items are as follows: Storehouse, $65,000; cable tanks, $40,000; loading room, $10,000; storage magazine, $3,400; service magazine, $700; wharf (part cost) $43,000; conduit system, $21,000; guard house and dormitory, $4,300; fence, $11,000; three observing stations, $10,000; total, $208,400; available, $100,000; balance required, $108,400, or in round numbers, $110,000.

Mr. **Borland.** What other items are included in the $260,000?

Col. **Wright.** The other item is the complete installation of the mine defense system at Galveston, Tex., which is estimated at $150,000.

Mr. **Borland.** Are there any there now?

Col. **Wright.** No, sir.

Mr. **Borland.** This is a complete new installation?

Col. **Wright.** Yes, sir.

Mr. **Borland.** Does that complete the points in continental United States where your program contemplates the installation of these mine defenses, or have you any other places in mind?

Gen. **Barrette.** There are no others; no, sir. The project is quite well laid out; it is well covered already. There are some items here for completing some places in the project, but there are no other new places.

Mr. **Borland.** The one at Galveston is a new one and we wanted to know whether there were any new ones that have not yet been reached?

Gen. **Barrette.** No, sir.

Col. **Hase.** The Galveston project was held up because there was quite a little controversy there in reference to the cession of lands to the United States by the State of Texas. They have now turned over to the Government title to the lands, free of all encumbrances, and we are now ready to go ahead with the project. It has been contemplated for a series of years but we have always been delayed on account of the fact we could not get a clear title to the land.

Mr. **Good.** You have had submarine mines there?

Col. **Hase.** Yes; and we might have gone ahead and put the mines overboard, but the store houses which the Engineers construct for us have not been built.

Mr. **Borland.** What is your intention as to being able to do this work at Cape Henry and Galveston within the next fiscal year?

Col. **Wright.** I should say that the Cape Heny work was rather doubtful, and that the Galveston work could probably be done.

Mr. **Borland.** Why do you speak of the Cape Henry work as doubtful—on account of labor conditions?

Col. **Wright.** Yes, sir; that is the principal consideration affecting the Cape Henry work; and also the fact that one of the essential items in this work is the wharf, of which I have spoken previously, and which is in such an unsatisfactory condition.

Mr. **Borland.** As to the Galveston work, you think everything now is in shape to go ahead with the work?

Col. **Wright.** Yes, sir; with the cession of title to that land so that we will have no difficulty with reference to the site.

Mr. **Borland.** The acquisition of the title has now been completed?

Col. WRIGHT. Yes, sir; we have an opinion from the Judge Advocate General that we can proceed.

Mr. BORLAND. And the only thing that would affect that would be the general condition of labor and material throughout the country?

Col. WRIGHT. Yes, sir.

Mr. SLEMP. Do you consider the installation down at Cape Henry as essential or vital to the protection of the harbor and the Government operations there?

Col. WRIGHT. That is a question which perhaps Gen. Barrette can answer better than I can. I should say that in the absence of gun defense at Fort Story it would be advisable to have the mines, if we could go ahead with the work? They have some light guns there and we could put a mine field out and maintain it with the light guns which have been temporarily emplaced.

Mr. BORLAND. At Cape Henry, in answer to Mr. Slemp's question, you said you considered it desirable to install this mine field there opposite Fort Story, notwithstanding that the fortifications are not emplaced.

Col. WRIGHT. I made that statement because we have light guns at Fort Story on temporary emplacements which will be necessary to prevent counter mining operations to destroy our mine fields, and therefore it is probable we can maintain our mine defense.

Mr. GOOD. Colonel, what method is employed in bomb-proofing these casemates?

Col. WRIGHT. We construct over them a roof which is composed of reinforced concrete 5 feet in thickness, and that is overlaid by 9 feet of earth.

Mr. GOOD. The construction is similar to that used in the ammunition chambers of a battery?

Col. WRIGHT. Yes, sir; generally similar to that.

SITES FOR FORTIFICATIONS—ROCKAWAY BEACH, FISHERS ISLAND, LONG ISLAND SOUND, SAN FRANCISCO, AND LOS ANGELES.

(See p. 6.)

Mr. BORLAND. Your next item would have been "for procurement or reclamation of land, or rights pertaining thereto, needed for site, location, construction, or prosecution of works for fortifications and coast defenses," that is omitted from the present bill. There is no land or rights pertaining thereto that you need to acquire this year?

Col. WRIGHT. None for which we have not the money, sir.

Mr. BORLAND. What is the condition of your balances in this fund?

Col. WRIGHT. On March 31 there was an allotted balance of $24,491.06, and an unallotted balance of $93,205.95, making the total cash available $117,597.01. Of the allotted balances, the largest single item was an item of $20,540.19 for the reclamation of the site at Rockaway Beach.

Gen. ABBOT. That was entirely finished about the time I left New York, but there was a break in one part of the wooden retaining bulkhead at one point on the Jamaica Bay side, and it may have been necessary to repair that.

Col. WRIGHT. This was under date of March 31, and that $20,000 we should be able to withdraw from the district officer.

Mr. BORLAND. How about your unallotted balance? For what purpose could you use that?

Col. **Wright.** As to the unallotted balance we have an obligation of $46,500 for the purchase of Calf Island, in Boston Harbor. Calf Island is desired for the emplacement of guns for the defense of Boston, and we condemned the ground and secured a verdict of $46,500, but payment on that has not been made. In addition to that amount, there are condemnation proceedings pending for the purchase of a portion of the site for two batteries near the Mispillon River, in Delaware. A portion of that site has already been secured.

Mr. **Borland.** How much will that take?

Col. **Wright.** The portion which has been secured was obtained for $9,000. As to the remainder, condemnation proceedings have been instituted, and in accordance with the provisions of the act passed last July, we have meanwhile taken possession of the ground and have gone ahead with the construction of our emplacements, but we do not know the amount of the verdict.

Mr. **Borland.** Will it come within your unallotted balance?

Col. **Wright.** Yes, sir; it will be less than that.

Mr. **Borland.** Are you clear at this time that the $20,000 at Rockaway Beach will not be needed?

Col. **Wright.**.I should like to look into the status of that a little bit further before I speak definitely about that.

Mr. **Borland.** I wish you would.

Col. **Wright.** But from Gen. Abbot's report, as to the status of the work last year, I think it will not be needed.

Note.—Unless some unforeseen contingency occurs this balance of $20,000 will not be required.

Mr. **Slemp.** You do not propose to install the guns at Boston any time in the near future?

Col. **Wright.** No, sir; we have not even submitted an estimate for it.

Mr. **Slemp.** Do you think it wise to go ahead and acquire the property with that idea ultimately in view?

Col. **Wright.** The property has been condemned and all that it is necessary for us to do now is to pay the judgment. It is not probable that we will be able to commence work on Calf Island for a considerable time to come. That was not among the first places to be fortified. We did not submit an estimate for the Boston construction this year, and we have also, with your permission, withdrawn our estimates for other construction which had priority over the Boston construction.

Gen. **Abbot.** In getting land, it is sometimes advisable, when you have got condemnation suits as far gone as that, to complete them, because prices are apt to be unfavorable in case you stop and start over again.

Mr. **Byrns.** As a matter of fact, this has already proceeded to judgment.

Gen. **Abbot.** Yes; and I think it should be completed in fairness to the owner.

Col. **Wright.** I have here a statement that the owner demanded $75,000 for that property when an attempt was made to secure it by negotiation.

Mr. **Good.** Colonel, from the state of your balances I take it the Government has acquired title to the site at Rockaway Beach?

Col. **Wright**. Yes, sir.

Mr. **Good**. At the last hearings that matter was still in dispute.

Gen. **Abbot**. We got that from the State of New York finally.

Mr. **Good**. How about the rights of the Southern Pacific?

Gen. **Abbot**. There is going to be a great fight over that. The State ceded the land to the United States under a special act of the State legislature, and there is a controversy, involving about $1,500,000, between the State of New York and the Southern Pacific Railroad over the difference between what the State offered to pay and what the owners think the land is worth, but the United States is free from that question. We have a clear title from the State of New York.

Mr. **Good**. In getting title, did you get title also to that portion which you desired which was under water and was claimed by the city?

Gen. **Abbot**. Yes, sir; we got a clear title to the site we wanted from the State of New York.

Mr. **Good**. How many acres did you get—about 300?

Gen. **Abbot**. Something in that neighborhood; yes, sir. It gives us 6,000 feet on the ocean and a connection about 400 or 500 feet wide back to the Jamaica Bay side for our landing, which is all we need for the fortifications there.

Mr. **Good**. What was the price paid?

Gen. **Abbot**. $705,000 That was the price we paid the State. Then, we have reclaimed by filling the submerged land; but you were asking only about the fee price, as I understand it.

Mr. **Good**. Yes; the price paid the State.

Gen. **Abbot**. We paid the State exactly what, after long negotiations, we had succeeded in beating the owners down to. Then the State said they would take the responsibility off our shoulders at that price and they would fight the owners over the rest of the matter.

PROTECTION OF THE SHORE OF THE SANDY HOOK RESERVATION, N. J.

Mr. **Borland**. The next item is "For the protection of the shore of the Sandy Hook Reservation, N. J., $60,000." Colonel, have you had a previous appropriation for this same purpose; and if so, how much?

Col. **Wright**. That item of $60,000 for Sandy Hook we would like to withdraw. On account of the fact of its being a very urgent matter, we were able to secure the $60,000 from the Coast Artillery from their appropriation for contingent expenses for seacoast defenses. The money has been secured by us, and for that reason there is no necessity of its being appropriated in this bill.

Mr. **Borland**. You have a supplemental estimate in Document 1083 for the protection of the shores of Sandy Hook Reservation, N. J., to be immediately available and remain available until expended, $400,000.

Col. **Wright**. Yes, sir.

Mr. **Borland**. And then this supplemental estimate, which you have just handed to me, "For the protection of the shores of Sandy Hook Reservation, N. J., to be immediately available and remain available until expended, $278,250."

Col. **Wright.** Yes, sir.

Mr. **Borland.** Is that a part of the $400,000 or in lieu of the $400,000?

Col. **Wright.** That is in addition to the $400,000.

Mr. **Borland.** So that you are asking $678,250.

Col. **Wright.** Yes, sir.

Mr. **Borland.** Will you give us an explanation of that?

Gen. **Abbot.** The Sandy Hook question is one of how much value to the United States a road and railroad connection between the defenses of Sandy Hook and the mainland of New Jersey is worth. As long as the Sandy Hook Proving Ground was in operation and they were receiving heavy guns and other material of that kind it had always been understood that that connection was absolutely essential.

It is now a question of maintaining this connection with the seacoast defenses situated on Sandy Hook. Our estimate is the best approximation that the Engineer Department can make of the cost of preventing the ocean from breaking through. That attack on the shore of New Jersey has been going on now for a number of years; before that time the shore was making out. The Sandy Hook reservation is very largely a creation of sand moving up the New Jersey shore during the last 125 years. Of late years they have been putting in protective works to the south of Sandy Hook, collecting sand traveling up the shore and building out private lands to the south. That has stopped the supply which used to form Sandy Hook, and Sandy Hook Neck is now washing away. This is a narrow neck between the main body of the reservation and the shore of New Jersey to the south of Raritan Bay. The only way that connection can be held is by main force and considerable stone. Our estimate covers what we believe is enough to make that railroad connection and road connection reasonably safe for a considerable length of time, but when a shore is cutting as regularly and for such a long time as this part of the New Jersey shore has been cutting it takes a very large sum of money to stop it. The whole question which we put up before the committee is whether the value of that road and railroad connection is equal to what we believe would effectually hold that isthmus, I presume, for a period of 10 years; after that time it may start to make out again or it may require more funds to hold it. I think the Chief of Coast Artillery can give the committee his estimate of that value better than we can.

Mr. **Borland.** Before I ask him that, have you been carefully over these estimates yourself in such detail as to be able to assure the committee that this expenditure will have the effect of holding that shore?

Gen. **Abbot.** I was a member of the Board of Engineers when this problem was under study, and it has been continued since I left the board. We have had the protection of that isthmus under study for the last four years and I believe the figures in the above estimate are as well considered as they possibly could be. I think nothing less than that sum of money will give us even a bare chance of holding that shore for 10 years.

Mr. **Borland.** That is not exactly my question. Would you feel reasonably safe, on your professional judgment, in saying that the plans contemplated by the expenditure of this money will hold the land?

Gen. ABBOT. I believe it will for 10 years; beyond that time I believe no engineer would risk his reputation by saying what the tendency of that coast will be. By the end of 10 years the work we are now doing may be behind the real beach buried in sand or it may be very seriously attacked. That is something you can not foresee because these changes take place in the attacks of the ocean on beaches up and down the whole Atlantic coast.

Mr. BORLAND. On what basis have you made these estimates? On the basis of war prices for material and labor?

Gen. ABBOT. The prices at which we think we can get the stone put in at the present time; yes, sir. The report came in about a month ago.

Mr. BORLAND. Of what do these improvements consist—a sea wall?

Gen. ABBOT. A heavy wall of large riprap and some wooden groins in front to retain what sand is there and the filling behind this wall with sand to reinforce and support it. Then we intend to put an apron perhaps 30 feet wide over the surface of the fill in rear of the wall so that when the waves wash over the top of the rocks they will not erode the filling as they did at Galveston.

Mr. BORLAND. Will riprap hold such an eroding bank as that?

Gen. ABBOTT. Enough of it; yes, sir.

Mr. BORLAND. Would it not take either a sea wall or a revetment?

Gen. ABBOT. Riprap is vastly better. I put in riprap on a badly cutting shore in South Carolina in the late eighties; I put in a wall very much of this kind, where the shore was cutting rapidly, and that wall has held up to the present time through many West Indian hurricanes.

Mr. BORLAND. Do you know what effect riprap has on the eroding banks of the Missouri River?

Gen. ABBOT. Yes, sir.

Mr. BORLAND. The riprap just naturally disappears; it sinks into the sand and gradually separates itself and the first thing you know the rocks that compose the riprap are all gone.

Gen. ABBOT. We riprap on the seacoast with from 5 to 10 ton blocks of stone instead of the smaller stones; we put under them smaller stones so that the waves do not get down to the sand; we count on stone being washed down into the sand foundation to a depth of 8 or 10 feet, and débris that washes down from the main pile forms a hardpan outside of the big riprap, and takes the splash of the retiring waves. A sea wall has to take the direct blow of the waves and that involves an enormously expensive construction, but with a mass of large riprap the waves break through it and are torn up into eddies and swirls and it holds very much better than solid masonry; it is on a slope and a wave rolls up and breaks as it comes. We find we can hold sand under these circumstances a great deal better by putting in large masses of heavy stones and letting them move and adapt themselves to the forces in action rather than to try to build an artificial structure strong enough to stand such strains. This riprapping is similar to harbor structures I built at Charleston, S. C., composing two jetties. Those jetties are in perfect shape now although they have had no stone added to them since 1886. They run out 19,000 feet into the ocean and are exposed to the full fury of the storms.

Mr. Borland. Do they protect sand formations?

Gen. Abbot. They are right on sand; they have not settled in 20 years and have not been injured by the storms that have come up in that time.

Mr. Borland. Was there an actual erosion of that sand before you put in the riprap?

Gen. Abbot. They were put in to avoid erosion; yes.

Mr. Borland. They were put on a shore that was then eroding?

Gen. Abbot. Yes; it was shifting, and that was one of the most shifting ocean bars you could find; these jetties went right over shifting sands.

Mr. Borland. Do you think this work would hold that well?

Gen. Abbot. It would hold for 10 years; that is my professional opinion.

Mr. Borland. And that is the extreme life of this work?

Gen. Abbot. I would not guarantee it longer than 10 years.

Mr. Borland. And of course you could not guarantee these figures on existing prices?

Gen. Abbot. No; because we do not know what prices are going to be.

Mr. Slemp. How wide is the narrow neck you are speaking of?

Gen. Abbot. It is extremely narrow. It has been breached, absolutely breached, twice in late years, so that the water at high tide went across.

Mr. Good. How long is the proposed wall?

Gen. Abbot. It is something like 5,000 feet, I think. It is about a mile, in round figures.

Mr. Borland. The purpose of this, after you have saved that land, is to provide a right of way for the railroad that reaches the Government reservation.

Gen. Abbot. A railroad and a highway, connecting the reservation with the mainland of New Jersey.

Mr. Borland. Suppose you did not have that, could you run the highway and railroad out on a trestle?

Gen. Abbot. The trestle is mighty apt to go out in these winter storms, because if a breach takes place through the sand barrier there the big ocean waves go through, and it will be an expensive thing to maintain any connection. There is a wharf at the north end of the reservation at which boats of reasonable size can land, so that there is transportation available from New York to Sandy Hook independent of this railroad connection. It is an immense convenience to the people living there to be able to get ashore.

Mr. Borland. And of immense convenience to the proving ground.

Gen. Abbot. The proving ground has been moved, you know.

Mr. Borland. They are moving it piecemeal, but I did not know whether they expected to move it all or not.

Gen. Abbot. I think they do.

Mr. Borland. What about that, Gen. Barrette?

Gen. Barrette. I think so eventually, but it seems to me it is very gradual, because there was a lot there when I was there.

Mr. Borland. How long do you expect that proving ground to remain there? Have you any plans about that at all?

Gen. BARRETTE. That is under the ordnance, although we have a Coast Artillery garrison there of about 2,500 men.

Mr. BORLAND. Suppose this work is not done. How long will it be before the right of way is actually in danger?

Gen. ABBOT. A severe storm will probably knock the railroad out and then it would be necessary to repair it. We have a considerable amount of stone in there now which acts, as long as it lasts, as a partial protection to the ordnance trestle and the quartermaster road. The quartermaster road is ruined every time there is a big storm. The ordnance trestle up to this time has not been knocked out, but it is getting quite old, the timber is getting rotten, and it needs attention all the time. There was a proposition some five years ago to replace that timber trestle by a reinforced concrete trestle, with the idea that it would be strong enough to let the isthmus go and that it would stand up the way the East Coast Railway does in Florida.

Mr. BORLAND. On the east coast of Florida, you mean?

Gen. ABBOT. Yes, sir. If we do not do the work necessary to hold the neck and the ordnance wants its proving ground maintained, it will have to make an estimate for either building the trestle more strongly or for a maintenance fund to rebuild it whenever it is knocked out. These storms come in the winter time almost always, so that it may be that two or three times in a winter you would have several hundred feet of this ordnance trestle smashed and have to repair it at once.

Mr. BORLAND. Is there anything on that reservation except the proving ground?

Gen. ABBOT. Yes; seacoast defenses of heavy guns and a garrison.

Mr. BORLAND. They are not dependent upon the railroad except to the extent of moving their guns back and forth when they need to replace them.

Gen. ABBOT. No; and they can go by boat, too.

Mr. BORLAND. Gen. Barrette, do you want to add anything to that statement?

Gen. BARRETTE. The only point is that it is a convenience as far as the personnel is concerned. If it comes to using railway artillery, as we expect to do, that railroad down on the Hook would be valuable for that purpose; it would have a military value for that purpose. We expect to use railway artillery and I think the committee has already appropriated money for that purpose when we are able to manufacture it. When railway artillery is constructed Sandy Hook is one of the places where it would be used, and that means guns mounted on trucks.

Gen. ABBOT. This is not the only weak spot on the Jersey coast, but about 3 or 4 miles to the south of this is another place that has broken through several times, and the railroad company has endeavored to maintain that spot itself. We had a hearing before the Secretary of War the other day in which the Government was asked to help them fight the ocean in front of that land. The Secretary gave them very little encouragement. So that the railroad is liable to be breached not only at our isthmus but also from the town of Seabright as far south as the town of Galilee.

Mr. BORLAND. The same railroad?

Gen. ABBOT. Yes, sir. So if they are going to maintain artillery effectively on railroad mounts, we have got to find these weak places and we have got to hold them. We must remember the value of having heavy guns on mobile mounts for the defense of New York.

Mr. GOOD. The letter of the Secretary of War transmitting this estimate is dated May 1 and provides for $400,000. This additional estimate provides for $278,250. Does that contemplate additional work?

Gen. ABBOT. The first estimate was based on one-half of the work—not a half, but a part of the work—laid down by the board as that which was most urgently needed, while the $278,250 is to complete the board's project. If the neck is to be held, those first two items ought to be done quite soon; the other two will be necessary before it is a finished job. We preferred to put it right before the committee at this time.

Mr. GOOD. Then, with $400,000 you could——

Gen. ABBOT. Half do the work.

Mr. GOOD. And that would hold, in your opinion, for awhile?

Gen. ABBOT. For awhile, but not for any 10 years.

Mr. BYRNS. I understand that this $678,250 is for the work at Sandy Hook?

Gen. ABBOT. Yes, sir.

Mr. BYRNS. I understood you a moment ago to say that if this work were done it would be followed by other necessary work on another portion of the railroad?

Gen. ABBOT. No, sir; I said that if they wanted to use this railroad for railway guns, this work should be done. The railroad parallels the coast for 15 or 20 miles. There is another weak spot about 3 miles farther down the coast where the railroad is liable to be interrupted in the same way it is up at this isthmus. The Shrewsbury River runs parallel to the beach line and quite close to it for a considerable distance—in fact, all the way to Long Branch and all those summer places. The ocean breaks through into the Shrewsbury at these two different places in case of very heavy storms.

Mr. BYRNS. These two propositions are in no way connected?

Gen. ABBOT. No, sir; unless we want to go south with our big guns on railway mounts.

Mr. GOOD. If we are to use the railway mount as a part of our coast defenses, is not this territory quite important?

Gen. ABBOT. New York is the most important territory we have and the matter needs to be considered most carefully. The use of heavy mobile guns in repelling land attacks by large forces is something that we have got to take hold of seriously, and this railroad along the Jersey coast is one of the railroads that is admirably adapted to the use of railway artillery of heavy caliber.

Mr. BORLAND. Is there any place along there where a large force could land?

Gen. ABBOT. Yes, sir. There is 18 feet of water up to within a few hundred feet of the beach and it makes a very good landing place. For several months in the year there is quite a fishing industry there and there are fish pounds along that Jersey coast for some 120 miles. They habitually land their fishing boats on the front beach and send the fish to New York, and where they can land fishing boats they can land an attacking force. The only disadvantage is that the beach is separated from the mainland by this Shrewsbury River and its marshes, so that the enemy would prefer not to land in that upper few miles; they would go farther down, where the mainland comes out to the ocean. To be able to carry heavy caliber guns promptly down to the south end of the Shrewsbury River would be of immense benefit in defending the New Jersey coast against an incursion from the sea by large forces.

Mr. SLEMP. You would connect your railway mounts directly with your defenses?

Gen. ABBOT. Yes, sir. That means that those guns are available anywhere within the length of that railroad track.

Mr. SLEMP. How long is the track?

Gen. ABBOT. It must be about 25 or 30 miles.

Gen. BARRETTE. I think it is more than that.

Mr. SLEMP. How many miles have you along there that could be used in transporting the guns?

Gen. ABBOT. We have got to get the mounts and we have got to get the guns built. They are experimenting with the idea of seeing how heavy the guns may be that they can fire from these railway mounts that they are now developing. They are being used abroad, but we have not our seacoast railway mounts as yet.

Mr. SLEMP. You have no doubt about the efficacy of that sort of a defense?

Gen. ABBOT. That has got to come in the future, because it is being used elsewhere and we have got to meet the situation.

Mr. SLEMP. That is not a Government-owned railroad?

Gen. ABBOT. No; but we could seize it if we needed it.

Mr. SLEMP. The only alternative would be the construction of emplacements?

Gen. ABBOT. The construction of fixed emplacements and a great many of them at enormous expense.

Mr. SLEMP. What would be the relative expense? You could not estimate that, could you?

Gen. ABBOT. I could not, because we do not know how heavy the guns will be that can be mounted on these railway mounts; we do not know the cost of them or how heavy they will be.

Mr. SLEMP. What population would you figure you were giving protection to?

Gen. ABBOT. It would prevent landing forces attacking New York.

Mr. SLEMP. Is that the principal available place for the landing of troops in an attack on New York?

Gen. ABBOT. It is one of the places. They can land on Long Island; they can land on the Delaware River or or the Jersey shore.

Mr. SLEMP. Are the other two places in contemplation?

Gen. ABBOT. They have got to be held, too. If we can develop the railway mount it will help very much on the Long Island shore, but on the Delaware shore it is more of a question, because I do not think the railroad lines parallel that shore or are within reach.

Mr. BORLAND. From the standpoint of the Army artillery, the utility of that railroad along that neck would be to get the guns out from the Sandy Hook Reservation?

Gen. ABBOT. Yes.

Mr. BORLAND. If you had that railway maintained, you could get the guns from the Sandy Hook Reservation and run them down the New Jersey shore?

Gen. **Abbot.** Yes, sir.

Mr. **Borland.** Provided the rest of the railway was all right?

Gen. **Abbot.** Yes.

Mr. **Slemp.** It does not seem to me to be necessary to have the guns over on the Sandy Hook Reservation. You could have them at any other place along that railway line you wanted them, they not being necessary for the protection of that peninsula. You are then expending $617,000 to get a place to store these railway mounted guns, whereas they might have been stored anywhere along that railroad line, provided you purchased the site.

Gen. **Abbot.** The point is not quite right. It may be that you would want to use those guns offensively on that part of the coast between Sandy Hook and Galilee; to use them on that part of the coast you have got to maintain this railroad, and that is the reason for maintaining the railroad; not that the guns would be stored at Sandy Hook and run out necessarily, but that is a part of that railroad line where the guns would be available for use if you could maintain it.

Mr. **Slemp.** I did not understand that was the case before.

CONSTRUCTION OF SEA WALLS AND EMBANKMENTS.

Mr. **Borland.** The next item is, "For construction of sea walls and embankments, $93,000," which you had in the last bill. You are not asking anything in this bill. What is the condition of your balances?

Col. **Wright.** We had on March 31 an available balance of allotments of $23,595.22 and an unallotted balance of $30,348, making the total cash available March 31 $53,943.22.

Mr. **Borland.** As to spending your allotted balance, do you contemplate using that this year?

Col. **Wright.** Most of the allotted balance in all probability will be spent. The principal item in that allotted balance is $15,188.93 for a sea wall at Fort Winfield Scott in the harbor of San Francisco, and I have a note to the effect that the contract for the materials for this sea wall has been entered into and the work is in progress. From the amount of the balance, I should say that the work has not proceeded very far, but has been started. As to the other items, there is a $2,000 balance at Fort Warren, in Boston Harbor. This work is also in progress. There are also balances of approximately $3,000 each at Fort Monroe and at Tampa. Those are the large items of the allotted balance.

Mr. **Borland.** What is the condition of your unallotted balance? What do you contemplate doing with that?

Col. **Wright.** We have not definitely determined about the unallotted balance. There is a certain amount of work to be done at Fort Monroe. The allotment for that has not been made, though some $3,000 allotted balance is available from a previous piece of work, and it is my understanding that there is some doubt as to whether that work is to be done.

Mr. **Borland.** Who would know about that?

Col. **Wright.** I can give you the exact data about it to-morrow. Perhaps the other gentlemen here know something about it.

Col. Brigham. Nothing further than your statement that it might not be necessary to proceed further with it.

Col. Wright. That is on account of the fact that there now seems to be no danger of cutting at the point to protect which the sea wall was proposed.

Mr. Good. You usually keep somewhat of an unallotted balance in this fund to take care of emergencies, do you not?

Col. Wright. Yes, sir.

Mr. Good. Referring to the item we have just left, why could not the work be done under the language of this appropriation, "For construction of sea walls and embankments"?

Gen. Abbot. It could, but we thought it was such a large item it would be better to put it up to the committee and let them know exactly what it was for.

Mr. Good. I wondered whether there was some legal obstacle.

Col. Wright. No, sir; but we wanted you to understand exactly what we proposed to do with an appropriation of that size.

Mr. Borland. How much is the Fort Monroe item?

Col. Wright. We have an allotted balance of $3,132.16, and we have an unallotted balance of $30,348. The only item in sight for that unallotted balance is the Fort Monroe project, and there is some doubt, on account of changes in conditions there, whether it will be necessary to proceed with that work.

Mr. Borland. Did you state how much the Fort Monroe work would amount to if it was decided upon?

Col. Wright. I have not that data here.

Gen. Abbot. Something like $20 000. Sea-wall estimates are desperately hard to get accurate, because the cost depends upon what the sea is doing. If it starts to build out the shore, there is no use in wasting money, and if it continues to cut, you are apt to need a good deal more than looks reasonable when you first start in. That is the truth of it, and we simply do the best we can, based on general experience in like cases.

Note.—The appropriation for the sea wall at Fort Monroe was obtained for the purpose of holding the neck of land uniting Fort Monroe to the mainland. Subsequent to the passage of the appropriation bill and prior to the initiation of work the district engineer at Norfolk reported that there were indications that the neck of land was building up rather than being eroded, and that in consequence thereof the proposed sea wall might not be necessary. In pursuance of this report no allotment was made for the work, and the matter has been held in abeyance pending further developments at the site. Present indications are that the construction will not be necessary.

CONSTRUCTION OF ROADS, TRAILS, WATER AND SEWER SYSTEMS AT GUN AND MORTAR BATTERIES.

(See p. 5.)

Mr. Borland. For the construction of roads, trails, water and sewer systems, etc., for the service of seacoast fortifications, you had $40,000 last year. You are not asking for anything this year. What is the condition of that fund?

Col. Wright. We took that matter up, if you will remember, under the battery-construction item. You asked me regarding the road at San Diego, and I replied that the road had been finished and we were turning it over to the Quartermaster Corps.

Mr. Borland. Then that item disappears?

Col. Wright. Yes, sir.

Mr. **Borland.** I do not know whether I covered the point in my previous questions or not. Did the work at Fort Rosecrans exhaust that money?

Col. **Wright.** I have not that information. I will get that data and bring it up to-morrow morning.

Note.—From the appropriation for roads, sewers, and water supply at Fort Rosecrans there remains an allotted balance of about $12,000, which will be used to complete the sewer and water systems now under construction. As stated in response to previous questions, the road system has been completed.

TRANSFER OF CERTAIN LANDS BETWEEN LAGUNA MERCED RESERVATION AND OCEAN HOUSE ROAD, SAN FRANCISCO, CAL.

Mr. **Borland.** You are asking for some new language, as follows:

> The Secretary of War is authorized to transfer to the owners of the adjacent land, in partial consideration for the transfer to the United States of an easement in other land of said owners, the title of the United States to a right of way now owned by the United States and located between the tract of land known as the Laguna Merced Reservation and an abandoned public highway formerly known as Ocean House Road (also called Ocean Avenue) in the city and county of San Francisco, California.

What does this refer to?

Col. **Wright.** That occurred in connection with the Fort Funston site. I have here a map which will show the situation. The area which is outlined in green is the Lake Merced Reservation, which we call Fort Funston, and on which we propose to mount armament for the defense of San Francisco. The previous reservation was here [indicating], and at the time that reservation was acquired a right of way was secured, which is roughly represented by this pencil line. That went out to that Ocean House Highway, and gave access to the reservation from the Ocean House Highway. Since the acquisition of this reservation the Ocean House Highway has been removed, and it is now proposed to exchange this right of way, which is of no further use to the United States on account of the fact it does not open on any existing street, for a right of way which goes out to Sloat Boulevard, which is an existing highway constructed by San Francisco, and which will give access to the reservation.

Mr. **Borland.** How it is possible to make the exchange? Are they the same landowners?

Col. **Wright.** Yes, sir; practically all of this land belongs to one owner.

Mr. **Borland.** How about the engineering features? Is this as good a road as the old one?

Col. **Wright.** It will provide a satisfactory means of entrance to the reservation. I should say that there was probably some hilly country there—judging by the way this road turns. This is not a contour map and I can not tell, but it does not seem reasonable that that turn would take place [indicating] unless there was some natural obstacle. We are informed that it does provide satisfactory access to the reservation and that it will connect with the existing street.

Mr. **Borland.** Is there anything there to show the width of that highway?

Col. **Wright.** I fancy it is about 50 feet.

Mr. **Good.** Is the road you first described, abandoned now?

Gen. **Abbot.** The road we were to connect with has been abandoned.

Mr. **Good.** Has that road been improved in any way?

Col. **Wright.** I think not.

Mr. **Borland.** What is meant by saying that this is in "partial consideration" for the transfer of the new road? Are you going to give them anything in addition to this?

Col. **Wright.** I think that was provided for when the Fort Funston site was secured. I fancy that this was a portion of the consideration in securing the reservation.

Mr. **Borland.** This language would not indicate that. It should say "balance of consideration," but this says "partial consideration." which would seem to indicate that we were going to pay something more.

Col. **Wright.** I will read the notes I have on that. The War Department project for additional battery construction for the defenses of San Francisco involves the construction of emplacements at Laguna Merced upon a parcel of land owned by the Government and located to the south of the existing Lake Merced Reservation, and also on a tract of land adjacent thereto. Negotiations for the acquisition of the latter tract have been in progress and are now completed. In order to afford a means of communication to the existing Laguna Merced Reservation, a right of way, extending by an indirect route from the limits of the the reservation to the then existing Ocean House Road, was awarded to the United States under condemnation proceedings at the time the existing reservation was acquired.

On account of the fact that the Ocean House Road has since been abandoned as a public highway by the city of San Francisco the existing right of way is incomplete, in that it does not extend to the public way, and a new right of way is accordingly acquired. In connection with the negotiations for the purchase of the additional land adjacent to the existing Laguna Merced Reservation an advantageous offer was secured from the owner of the adjacent land, involving as a condition precedent the transfer of the existing right of way to the said owner in partial consideration for the transfer to the United States of a new right of way between the boundary of the existing reservation and the public highway known as Sloat Boulevard. The new right of way will afford direct connection between the reservation and the city of San Francisco by way of Sloat Boulevard. The transfer of the adjacent land to the Government has now been accomplished, and the only thing remaining to be done to complete the transaction is the transfer by the Government of the existing right of way.

Mr. **Borland.** Then when the additional tract of land was acquired it was agreed at that time that this exchange of rights of way should be made?

Col. **Wright.** That was apparently a part of the consideration.

Mr. **Borland.** And there is nothing further to be paid by the United States, except what has already been paid for this additional tract of land?

Col. **Wright.** Yes, sir.

Mr. **Borland.** The wording of your amendment here does not quite cover that.

Col. **Wright.** Perhaps we should have worded it "in completion of consideration."

Mr. **Borland.** How are you getting to the Fort Funston Reservation now?

Col. **Wright.** I fancy they are probably cutting across the other gentleman's land.

Mr. **Byrns.** As I understood it, they had already transferred this right of way to the Government.

Col. **Wright.** The gentleman has probably given us the new right of way, but we have not paid him in full for it; that is about the size of it.

Mr. **Good.** The map which you have here would indicate that the acreage involved is about the same.

Col. **Wright.** Apparently.

PURCHASE, MAINTENANCE, REPAIR, AND OPERATION OF MOTOR-PROPELLED PASSENGER-CARRYING VEHICLES.

Mr. **Borland.** You have a small item here for "purchase, maintenance, repair, and operation of motor-propelled, passenger-carrying vehicles"; expenditures are authorized to an amount not exceeding $2,300. You want to increase that to $3,250?

Col. **Wright.** Yes, sir.

Mr. **Borland.** What do you do with that money? Is it for new cars or for maintenance of old cars?

Col. **Wright.** At the present time we have two automobiles—one at Galveston and one at Los Angeles—and we wish to purchase another one for use at San Francisco. The maintenance and operation of these cars per year is estimated at $750 each, and the purchase of a new car for the San Francisco district is $1,000. That will give the total of $3,250 which we have estimated, and the increase is accounted for by the purchase of this new car for San Francisco

Mr. **Byrns.** What kind of a car do you get?

Col. **Wright.** It will probably be a Dodge.

CONSTRUCTION OF LAND DEFENSES, INCLUDING PROCUREMENT OF EQUIPMENT AND MATERIALS, CONSTRUCTION AND REPAIR OF ROADS, ETC., UNITED STATES.

Mr. **Borland.** The next item is:

> For the construction of land defenses in the United States, including the procurement of equipment and materials required therefor, the construction and repair of roads required for military purposes, and the procurement and installation of searchlights, $2,000,000.

What did you do with the $2,000,000? Did you spend it?

Col. **Wright.** No, sir; we have been able to spend only about $4,000 out of that appropriation.

Mr. **Borland.** What was the purpose for which you got this $2,000,000?

Col. **Wright.** The purpose was to provide for the accumulation in the coast defenses of material which would be needed in connection with the construction of land defenses to protect the rear of the coast fortifications. The fortifications, as you know, are constructed with a view to defending harbors from naval attack, and they have been entirely open to attack from the rear in case parties could be landed on our coast at some point which was undefended and not reached by the fire of existing batteries. In order to prevent attacks upon our coast fortifications by such parties, plans have been in the course of preparation for a number of years which look to the construction of defenses for the rear of these coast fortifications after hostilities have been commenced. In order to provide for the rapid construction of these, it was desired to accumulate in the coast fortifications the material which would be necessary to do the construction work and this item was included, for the most part, with the idea of providing that material in the coast defenses.

Mr. Borland. And that has not been done?

Col. Wright. That has not been done.

Mr. Borland. Because no very urgent need has appeared for it?

Col. Wright. Not only has no very urgent need appeared for it, but the material would cost very greatly at the present market rate; and also to go into the market at the present time for this material, for which the need is not very urgent, would divert to these uses material which is much more urgently needed in other directions. For that reason we have not expended the appropriation.

Mr. Borland. And you do not contemplate expending it in the near future?

Col. Wright. No, sir.

Mr. Slemp. Suppose you state what you spent the $4,000 for.

Col. Wright. The allotments which have been made were for fences at Strawberry Hill, Boston, for fences at the defenses of New Bedford and Narragansett Bay; for certain lighting at the defenses of eastern New York; and for the construction of fences at Norfolk (Fort Monroe) and at San Francisco.

CONTINGENT EXPENSES INCIDENT TO THE CONSTRUCTION OF COAST FORTIFICATIONS AND THEIR ACCESSORIES.

(See p. 115.)

Mr. Borland. The next item we have is, "for contingent expenses incident to the construction of coast fortifications and their accessories, $1,000,000," which was included in the deficiency bill of June 15, 1917. Do I understand that you have not spent that money?

Col. Wright. The contingent expense money will be accounted for by the artillery.

Mr. Slemp. What is the total allotted balance in fortification work for the year ending June 30, 1918?

Col. Wright. On March 31, 1918, the total allotted balances in fortification work were as follows:

United States	$4,109,181.40
Insular possessions	564,032.67
Total	4,673,214.07

Mr. Slemp. What is your total unallotted balance in coast fortification work for the year ending June 30, 1918?

Col. Wright. On March 31, 1918, the total unallotted balances in fortification work were as follows:

United States	$10,037,573.37
Insular possessions	598,532.04
Total	10,636,105.41

Mr. **Slemp.** What is the total estimate for your fortification work for the next fiscal year?

Col. **Wright.** The estimates for fortification work for the fiscal year 1919 are as follows:

	United States.	Insular possessions.
Regular estimates	$3,963,250	$1,433,500
Supplemental estimates	2,553,250	83,500
Total United States	6,516,500	1,517,000
Insular possessions	1,517,000	
Total	8,033,500	

Mr. **Slemp.** What is the amount of your unallotted balances implied or actual under contract?

Col. **Wright.** No part of the unallotted balances is under contract.

PER DIEM IN LIEU OF SUBSISTENCE.

Mr. **Borland.** There is new language in the bill:

> The several appropriations herein made and heretofore made in fortification appropriation acts shall be available for the payment of a per diem allowance not exceeding $4 in lieu of subsistence to civilian employees when allowed pursuant to section 13 of the sundry civil appropriation act approved August 1, 1914.

Have you heretofore had any per diem allowance for your civilian employees?

Col. **Wright.** Yes, sir; but if I may read section 13 of the sundry civil act I think the necessity for this will become apparent. The section provides:

> That the heads of executive departments and other Government establishments are authorized to prescribe per diem rates of allowance not exceeding $4 in lieu of subsistence to persons engaged in field work or traveling on official business outside of the District of Columbia and away from their designated posts of duty when not otherwise fixed by law. For the fiscal year 1916 and annually thereafter estimates of appropriations from which per diem allowances are to be paid shall specifically state the rates of such allowances.

The language which we have included in the draft of the bill was included in the estimates which were submitted for 1918, but it was not included in the bill as it became a law. It is resubmitted this year in view of the fact that the Auditor for the War Department has interpreted the provisions of section 13 of the sundry civil act, which I have just read, to mean that per diem allowances are authorized only when the appropriation act states specifically the rates of such allowances. Under that ruling, unless this language is included, we will not be able to pay our per diem allowances.

Mr. **Borland.** Prior to that ruling by the auditor you did pay them out of your various fortification appropriations?

Col. **Wright.** Yes, sir.

Mr. **Byrns.** Even now you can make an allowance for actual subsistence, can you not?

Col. **Wright.** An itemized account must be made of the actual expenses.

Gen. **Abbot.** They have to be sworn to, and that involves a great deal of paper work, the taking of receipts, the filing of vouchers, etc.

Mr. BYRNS. This is a provision which is carried with reference to appropriations made for all the other departments where they have field work.

Gen. ABBOT. It costs no more than the other way, because we put our per diem allowances of the district officers at such a rate that they will not exceed that amount. I had my per diem allowances under another bill fixed at $1.50 a day for one party and $2 a day for another party, and that just about covered what their food cost. At some other places it may be higher, but when you have parties on surveys in the field you can tell about what the cost will be: then you can assign a per diem allowance to a party and save a great deal of voucher work and accounting.

Mr. GOOD. Do you have very much field work done by persons who are given this allowance?

Col. WRIGHT. Yes, sir; I think there is a great deal of it done.

Gen. ABBOT. When you send out surveying parties it is almost the only way to provide for them. On construction work we hire men who subsist themselves or else we establish a boarding house system and feed our labor, but that can not be done as to men who are going around on inspections and inspecting manufactured articles.

Mr. GOOD. I was wondering whether on your construction work you would take a gang of men to a place, to put in an emplacement, for instance, and then pay this per diem to all, which would make the expense very great. But, as I understand, that is not intended at all.

Col. WRIGHT. Not at all; no, sir. As a general thing, where emplacement work is to be done in isolated localities, we provide the subsistence ourselves and include it as a part of the compensation of the men, and that subsistence is usually at very low rates. On some work I did in the Philippines we had our subsistence as low as 50 cents a day.

Mr. BORLAND. Are there any other items in this bill that you have charge of?

Col. WRIGHT. Nothing more except the insular possessions.

CONSTRUCTION OF SEACOAST BATTERIES, HAWAIIAN ISLANDS.

(See p. 89.)

Mr. BORLAND. For construction of seacoast batteries in the Hawaiian Islands you have an estimate of $500,000 and in 1918 you had $720,000. What is the condition of your balances?

Col. WRIGHT. The available allotted balance on February 28 was $200,635.62; the unallotted balance was $352,989.40, making a total available balance February 28 of $553,625.02.

Mr. BORLAND. What is the probability of your being able to use that allotted balance in the current year?

Col. WRIGHT. We can not state accurately the speed of construction on the project, which requires the construction of three of the 12-inch long-range batteries

Gen. ABBOT. We had a change of district officers out there, several of them, and just what shape the work is in is a rather hard thing to say.

Mr. BORLAND. Do you have any difficulty in getting labor and material out there?

Col. WRIGHT. No; I do not think so.

Mr. BORLAND. Where are those guns placed—on Oahu?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. You do not know what the progress of the work is?

Col. WRIGHT. We have no information as to how far along he is with that work. The only thing we have to judge by is that he has been able to spend $175,000 from the appropriation.

(See later information below.)

Gen. ABBOT. So he is at work, but how far he has gotten we can not tell you.

Mr. BORLAND. What is the prospect of getting guns for those batteries?

Col. WRIGHT. We already have the guns. They are the 12-inch guns which you will remember Gen. Barrette testified were in reserve at Sandy Hook.

Mr. BORLAND. But have you not used those guns for some other purpose?

Col. WRIGHT. Those guns are still available, are they not?

Gen. BARRETTE. We have those guns; yes, sir.

WEDNESDAY, MAY 15, 1918.

CONSTRUCTION OF SEACOAST BATTERIES.

(See p. 88.)

Mr. BORLAND. When we adjourned last night we were discussing the construction of seacoast batteries in the Hawaiian Islands. You had given me the allotted balance and the unallotted balance.

Col. WRIGHT. I can give you now the figures one month later than those I had last night. On the 31st of March, in the Hawaiian Islands, the allotted balance was $190,732.41, and the unallotted balance was $352,989.40.

Mr. BORLAND. Your allotted balance is devoted to those three projects which you called our attention to?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. Does your allotment complete those projects?

Col. WRIGHT. No, sir; we are asking you at this time for an additional amount of $500,000 for battery construction work which we think will complete the three 12-inch long-range batteries.

Mr. BORLAND. What do you intend to do with the $352,000 unallotted?

Col. WRIGHT. That is also to go on those batteries.

Mr. BORLAND. What is the total estimate on those batteries?

Col. WRIGHT. The total estimate we have received from the district officer is $1,533,000. Of that amount there was appropriated in the fortification bill of last year $720,000, which leaves to be supplied, according to that estimate, $813,000. These estimates for the three 12-inch long-range batteries appear, in the light of our experience in fortification work near by, excessive, and on account of that fact the district officer s estimate was arbitrarily reduced in the office of the Chief of Engineers by $313,000, so that our revised estimate for the batteries is now $1,220,000.

Mr. BORLAND. Of which $500,000 is asked for in the estimates o this year?

Col. **Wright.** Yes; and $720,000 has already been appropriated.

Mr. **Borland.** Suppose it develops after you have started on these works that the geologic condition there makes the work a great deal more expensive, you will still be under the necessity of going ahead, no matter what the expense is?

Col. **Wright.** Yes, sir; we will go ahead.

Mr. **Borland.** Have you made thorough tests of that?

Col. **Wright.** We think we have, sir. The cut in these estimates was made by Gen. Winslow, who constructed the first batteries that were built in the island of Oahu, and encountered about the same conditions as are encountered by the district engineer at the present time in his batteries which are presenting difficulties. It was Gen. Winslow's judgment, based on his experience, that the estimates could safely be reduced by $313,000 for those batteries. That is what the reduction was based upon.

Mr. **Borland.** I suppose consideration has been given to the question of whether that possible landing place can be protected from present defenses.

Col. **Wright.** It is much too far, sir.

Mr. **Borland.** Please inform us how far the work has progressed.

Col. **Wright.** The work at one point has not yet been commenced. As to the work at another, I will read from the last report of the district engineer:

> The site for the battery has been definitely determined and 7,000 feet of railroad from the wharf to the site constructed; also 4,050 feet partially constructed. Six test holes were bored at the battery site. A track was erected on the wharf; plant on hand was repaired and new plant purchased; contracts for cement were entered into and 2,000 barrels of cement received and stored; proposals for materials were issued; a pile driver was erected on the battery site and locomotives purchased; material was transported to the site of the battery and 100 steel piles driven around the gun block site. This was the status on the 31st of March, 1918. The probable operations for April contemplate the continuance of the construction of the railroad and the repairs to the plant, the erection of the stone bin and cableway for placing the concrete, the commencement of the construction of concrete piles and the excavation for gun blocks.

Mr. **Borland.** How much of this estimate is for each project?

Col. **Wright.** That I can only state approximately. The projects at two locations, on account of the difficulty which will be encountered in securing suitable foundations, will be more expensive than the construction at the third, where the site for the battery is favorable.

Mr. **Borland.** Have you not an estimate for the work?

Col. **Wright.** Not individually; no, sir. We have no estimate for the three batteries individually, but we have the total estimate for the three batteries.

Mr. **Good.** Last year Col. Winslow stated that the estimated total cost of one battery was $320,000, another battery $380,000, and the other one $340,000.

Col. **Wright.** You will observe that the figure which I am submitting this year is in excess of the sum of Gen. Winslow's figure, is it not?

Mr. **Good.** The total of Gen. Winslow's estimates was $1,040,000 for the three batteries.

Col. **Wright.** Yes, sir: and the estimate I am now submitting is $1,220,000.

Gen. **Abbot.** In the estimate last year we had presumed they had good foundations, but it has now developed otherwise at two points and they have got to have heavier foundations, that we did not figure on.

Mr. **Borland**. If the district officer has not changed his estimate at the third point, then of course the addition is all in the other two.

Col. **Wright**. I think it is safe to say that the addition is there. If we gave any figures at all as to the relative cost of these three batteries they would simply be guesses until borings are fully known.

Gen. **Abbot**. We do not want to give the committee any guess figures. Gen. Winslow having been out in that country for two years and a half was sure that a foundation could be put in there in a cheaper way than the district officer was figuring on. The plans were sent out for further study and we have not received them back, and therefore we have not the data on which to submit to the committee at this time any properly based estimates.

Mr. **Borland**. Your project calls for 12-inch guns?

Gen. **Abbot**. Twelve-inch high-angle guns.

Mr. **Borland**. At all points?

Gen. **Abbot**. Yes, sir.

Mr. **Borland**. Why are 12-inch guns needed to repel a landing party? I thought you repelled landing parties with 6-inch guns and sometimes with smaller guns.

Col. **Wright**. The 12-inch guns are required so that they may be able to keep off vessels which may come in to assist and cover a landing by the fire of their guns, and the extreme range possessed by these guns is desired in order that the number of batteries may be reduced. They have been placed so that they can cover a long line of beach in either direction. These guns will be able to cover a total length of beach of possibly 60,000 yards, which would not be the case were we to put in smaller caliber batteries.

Gen. **Abbot**. The experience at Gallipoli shows that under the concentrated fire of naval guns troops can land even if the landing place is held quite strongly by small guns and by troops in force.

Mr. **Good**. Will not the next step be to put in small guns to supplement these larger guns?

Gen. **Abbot**. They have these movable guns there at Scofield Barracks which can be moved around to the point of attack, but they are no good if they are outranged by a mass of naval guns and these 12-inch guns are to keep the navy far off. Then they can not overpower the American troops on shore with their heavy gunfire and let the boats come in with the enemy troops.

Mr. **Borland**. That question, of course, eventually resolves itself, so far as the immediate need is concerned, into the question of whether there is an enemy on the sea who is able to move freely.

Col. **Wright**. Yes, sir.

Mr. **Good**. With the construction of these batteries is it considered that the island of Oahu will be thoroughly protected.

Gen. **Abbot**. Yes and no, both. The question is how much value would the island of Oahu be to the enemy and how much naval force would he be likely to risk in trying to take it. This defense we are proposing would not stand, for instance, an attack by the entire British fleet, but in the best judgment of our General Staff and other officers it would stand off such a fleet as would be likely to undertake the attack of an island of the value of Oahu. We have to provide very much heavier defenses for a place like New York City than we do for Oahu.

Mr. **Slemp.** Are you minimizing the strategic importance of Oahu in favor of some other island in the Hawaiian group?

Gen. **Abbot.** Oh, no, sir.

Mr. **Slemp.** I have been looking upon it as one of the most important strategic points that we have anywhere, either on our coast or off our coast, as constituting the basis of our western defenses.

Gen. **Abbot.** It is a most important point, but in deciding how much armament should be put there, the board in laying out the defenses provided what they considered sufficient to refuse the island to any fleet that would be likely to be detailed to take the island. In order to determine what armament was necessary they had to form an estimate of how many vessels would be sent against it, and that they undoubtedly did.

Mr. **Slemp.** Then you did not mean to minimize the importance of it strategically?

Gen. **Abbot.** Not at all. I was simply saying that in the judgment of the Strategic Board, which settles this question, this armament is considered sufficient to hold off any fleet that would probably be sent against it.

Mr. **Slemp.** Would that be true of the opposite end of the island from which Honolulu is situated?

Gen. **Abbot.** In order to hold Oahu we have got to prevent them getting ashore, in reality, because the island is of such size that it is easier to keep people off entirely than to fight them on shore.

Mr. **Slemp.** Then the only way to prevent that is by placing batteries all the way around the island?

Gen. **Affot.** It is not quite as bad as that, because there are many places where you can not land, especially on the northeastern shore.

Mr. **Borland.** General, your idea is in order to successfully repel a landing which is well supported you would have to have guns large enough to stand off the fleet protecting the landing force?

Gen. **Abbot.** Yes, sir.

Mr. **Borland.** And then we would have to have guns large enough to prevent a landing?

Gen. **Abbot.** Yes, sir; and that can be prevented by mobile field artillery.

Mr. **Borland.** And then you would have to protect practically all the points at which a landing was practical?

Gen. **Abbot.** Yes, sir; and by using very long-range guns we can place the batteries a comparatively long distance apart and attain that object.

Mr. **Borland.** And in concentrating the protection on Oahu, the idea is that Oahu would be the key of the group of islands because our naval station is there?

Col. **Wright.** Yes, sir. The thing we want to hold in the Hawaiian Islands is Pearl Harbor; that is what we are chiefly interested in.

Mr. **Good.** This estimate, then, is to complete the battery construction for those 12-inch guns, to be mounted for high-angle fire?

Col. **Wright.** Yes, sir.

Mr. **Good.** Do you contemplate that that work will be finally completed and turned over to the Ordnance Department by the end of this fiscal year or the next fiscal year?

Col. WRIGHT. By July, 1919?

Mr. GOOD. Yes.

Col. WRIGHT. I would not say we would have it all completed; no, sir. It will run into the next year almost certainly, but we expect to be able in the next fiscal year to run through the balance which we have now and to commence on the $500,000 which we are asking for in the new bill.

Mr. GOOD. Has there been any change in the Board of Review program so far as the Hawaiian Island defenses are concerned?

Col. WRIGHT. I think not, sir.

Mr. SLEMP. What is the attitude of the War Department in regard to fortifying the other islands in the Hawaiian group?

Col. WRIGHT. I do not think that the fortification of any other island in the group has been seriously considered.

Mr. SLEMP. It all relates to the naval base at Pearl Harbor.

Col. WRIGHT. Pearl Harbor is the thing which we wish to keep in the Hawaiian Islands. The other islands are valuable from an agricultural standpoint more than anything else.

Mr. SLEMP. And if a landing force got on there it would eventually be driven off by the forces at Oahu and at Pearl Harbor?

Col. WRIGHT. In all probability; yes, sir.

Gen. ABBOT. The measure of the defense of any one of these places is its desirability to the enemy. If it is a thing they would desire very greatly, we would put very heavy defenses to keep it. If it is a matter of less value to the enemy, we would put in less defenses to refuse it to them.

Mr. SLEMP. And the value to the enemy would be wrapped up in the idea of getting a naval station there for supplies and reserves?

Gen. ABBOT. Yes, sir; and repairs.

Col. WRIGHT. The repair proposition in connection with that naval station is very important. It is necessary that we have a refuge to which our fleet may be able to withdraw in case, in action with the enemy, any of our ships may be injured. In order to repair their injuries, the dry dock at Pearl Harbor has been constructed and a very extensive naval base and repair plant established. Our nearest naval stations other than Pearl Harbor which are in any degree equipped to do work of that kind are at San Francisco, over 2,000 miles away.

CONSTRUCTION OF SEACOAST BATTERIES—PHILIPPINE ISLANDS.

Mr. BORLAND. In the Philippine Islands you had $300,000 way back in 1915 and have not had any money since then until your present estimate of $320,000. Is there any unexpended balance from your last appropriation?

Col. WRIGHT. You have omitted one appropriation that we secured, sir. In the bill of March 28, 1918, an appropriation of $75,000 was made, which is probably not noted in your book.

Mr. BORLAND. No; it is not. What was that for?

Col. WRIGHT. The appropriation applies indirectly to the completion of Fort Dunn. The district officer began running very low in his cash on hand for that work about July or August of last year, and as a result of his representations the Chief of Engineers consulted the committee and with the committee's approval diverted to the work in the Philippine Islands $75,000 of the money which it had been intended to use on the work in the Hawaiian Islands. This $75,000 was reappropriated in the act of March 28, 1918, and restored to the Hawaiian Island appropriation.

Mr. BORLAND. Does that complete the work?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. Has that money been used or simply been allotted?

Col. WRIGHT. It has been allotted and some of it used. The work is in progress, and they are finishing it at present.

The available balance allotted on February 28, 1918, was $117,-562.49. The unallotted balance was $4,497.20, making the total available cash $122,059.76. This sum is to be applied chiefly to the completion of the construction of Fort Dunn and to the completion of the new mortar battery at another point.

Mr. BORLAND. Will it complete those works?

Col. WRIGHT. Yes, sir; and will leave small balances. I should say that after those works were completed we will in all probability have in the neighborhood of $20,000.

Mr. BORLAND. What is the basis of your estimate of $320,000 this year?

Col. WRIGHT. The new estimate is intended to install a battery of two 12-inch long-range guns.

Mr. BORLAND. Have you a map there of Manila Bay?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. Is it expected that this estimate of $320,000 will complete that work?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. When do you expect you will be able to do that work?

Col. WRIGHT. As soon as we get the appropriation, sir. The sites are all Government-owned and there is no difficulty in commencing.

Mr. BORLAND. Has the work been begun?

Col. WRIGHT. No, sir; we have not had any money for it.

Mr. BYRNS. How long will it take to complete it?

Col. WRIGHT. I should say from a year to a year and a half. I might also say that with the $320,000 which we are asking we also intend to go ahead with our antiaircraft defense. That has been commenced under existing battery construction appropriations, for which I accounted previously, and we are including an item of $37,500 to proceed with the antiaircraft defense. The antiaircraft defense will have to be entirely on fixed mounts on account of the topography of the island which makes it impossible to use mobile guns.

Gen. ABBOT. There are high hills and deep ravines all around.

Col. WRIGHT. It is very badly cut up.

Mr. BORLAND. The theory of that antiaircraft defense would be to protect the fortifications from aircraft attack?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. And not to protect the city of Manila?

Col. WRIGHT. No; it is much too far from Manila to protect the city.

Mr. BORLAND. How extensive are these antiaircraft defenses to be?

Col. WRIGHT. We now contemplate 15 guns.

Mr. BORLAND. How about the antiaircraft defense of the city?

Col. **Wright.** There has been no provision for that, but it could be handled by mobile guns at a later date, if considered sufficiently worth while.

Mr. **Borland.** How far will your $37,500 go toward these antiaircraft defenses?

Col. **Wright.** It will complete our work.

Gen. **Abbot.** As far as guns and emplacements are concerned.

Col. **Wright.** Of course, the guns are furnished by the Ordnance Department.

Mr. **Borland.** Your $320,000, then, would complete the 12-inch battery and the antiaircraft defense?

Col. **Wright.** Yes, sir.

Mr. **Borland.** Have you anything else on your program there?

Col. **Wright.** Not in the way of battery construction, sir.

Mr. **Good.** These emplacements for antiaircraft guns are an addition to the Board of Review's project for the defenses at Manila, is it not?

Col. **Wright.** Most of them are. The board provided for a very limited antiaircraft defense at Manila.

Mr. **Good.** You are now estimating for $70,000 in excess of what the Board of Review estimated it would cost to put in these emplacements. You have accounted for $37,500 of the increase by saying that it was to be used for putting in emplacements for antiaircraft guns. How about the balance of that increase?

Col. **Wright.** I fancy that must be in connection with the long-range batteries, sir, because that is the only thing we have.

Mr. **Good.** The Board of Review's project was for 12-inch long-range guns.

Col. **Wright.** Yes, sir.

Mr. **Good.** What is the reason for that increase?

Col. **Wright.** There is a certain amount of increase in the cost of material, of course, and a further investigation of the site has perhaps disclosed some trouble, although the sites in that locality are usually very favorable. The portions of the island on which the heavy batteries are located are high and we usually meet with little or no difficulty with regard to sites at that place.

PROTECTION, PRESERVATION, AND REPAIR OF FORTIFICATIONS, HAWAIIAN ISLANDS.

Mr. **Borland.** Your next item is for the protection, preservation, and repair of fortifications at the following localities. The first is the Hawaiian Islands, for which you are asking $12,500. You had $7,500 in 1918. How did you get along with that?

Col. **Wright.** On March 31, 1918, there was an allotted balance of $2,013.38, and no unallotted balance.

Mr. **Borland.** What is the occasion of your increasing the estimate to $12,500 this year?

Col. **Wright.** The occasion is, sir, that we expect that even this $2,013 will be undoubtedly exhausted before the end of the present fiscal year. Also certain items of work were held over from last year on account of the fact that our estimate was cut at that time, and the necessity for them, which was then urgent, is even more so this year.

Mr. **Borland.** What is this urgent work that you say was cut out last year?

Col. WRIGHT. The work that we have particularly in mind, sir. is the resodding of the slopes of the Fort Kamehameha batteries. This item was brought to the attention of the committee last year. and you will find it on page 56 of the hearings. There is an accumulation of work in the Hawaiian Islands under this preservation and repair item. Our appropriations for that purpose have been comparatively small and the district officer has found each year for some years past that he has been unable to do work which has been requested by the Artillery and which it is desirable to do. He has had to confine his work to the most essential items and leave out items which he really thought he ought to do, but which he had to subordinate to other work which was of even more pressing importance.

Mr. BORLAND. Your appropriations have been relatively small. but they have grown in a relatively large percentage—from $500 in 1913 to $7,500 in 1918.

Col. WRIGHT. Yes, sir.

Mr. SLEMP. In the itemized statement under this estimate you have $6,000 for equipment and material, and you said the main part of the work will consist of resodding Fort Kamehameha. On page 56 of the hearings of last year I notice that the resodding of one battery cost $700, another one $1,000, and another one $500.

Col. WRIGHT. Yes, sir.

Mr. SLEMP. So that the statement you originally made, that most of this work was to be the resodding of Fort Kamehameha would not be correct, would it?

Col. WRIGHT. The total amount, according to last year's estimate. for the resodding work at Fort Kamehameha was $3,400.

Mr. SLEMP. I understood you to say, in response to the chairman's question, that the major part of this $12,500 was to be used for resodding.

Col. WRIGHT. Not the major part of the $12,500, but the major part of the increase in the estimate which I am asking for. We had $7,500 last year and this year I am asking for $12,500, making an increase of $5,000, and the impression I intended to give was that the increase of $5,000 was intended, in large part, to resod these batteries.

Mr. BYRNS. Is there any special necessity for resodding the batteries during the next fiscal year?

Col. WRIGHT. Yes, sir; there is. The batteries at Fort Kamehameha are built very largely above the ground on account of the nature of the site. The rains in the Hawaiian Islands are very heavy and the slopes of the batteries being entirely of fill will very rapidly erode and wash away unless they are constantly kept in repair. It is necessary to hold those slopes if the protection of the battery is not to be materially reduced and a very large amount of repair work made necessary at a later date.

Gen. ABBOT. It is cheaper to hold the sand, which is the projectile-resisting material, than it is to get new sand and put it in afterwards and then hold it.

Mr. SLEMP. Is there any general fund from which you get money to do that work?

Gen. ABBOT. This is the general fund.

Col. WRIGHT. That is the only one we have, sir.

PROTECTION, PRESERVATION, AND REPAIR OF FORTIFICATIONS, PHILLIPINE ISLANDS.

Mr. **Borland**. I notice that in the Philippine Islands you had $15,000 last year. How did you get along with that?

Col. **Wright**. There was an available allotted balance on February 28 of $5,797.51, and no unallotted balance.

Mr. **Borland**. This year you are asking for $50,000?

Col. **Wright**. Yes, sir.

Mr. **Borland**. What is the basis for that $50,000 estimate?

Col. **Wright**. The reasons for that $50,000 estimate are summarized by the district engineer as follows: The construction work is very near completion and the maintaining of the defensive features of these coast defenses will hereafter depend on funds received from the maintenance appropriations. The costs of materials and supplies have very greatly increased in the Philippine Islands, perhaps even more so than in the United States, on account of the fact that almost all of the materials and supplies must be transported long distances by sea, and the high freight rates have their influence on the costs in the Philippines. The maintenance of the roads and trails, which are a portion of the land defense system, requires constant attention, and, due to the rapid growth of vegetation in the Tropics, the clearing of certain localities, which is considered an essential feature of the land defense, must constantly be attended to. Then it is expected to turn over to the artillery early in the coming fiscal year the entire fortification at Fort Drum and a new mortar battery at another fort. Those two items will require maintenance, and while that will probably not be very great in the case of the new battery, it will be considerable at Fort Drum, as the money there will go into the maintenance of the mechanical and electrical installation, which, on account of the nature of the fort, will have to run 24 hours a day and 7 days a week.

Mr. **Borland**. How much is that item?

Col. **Wright**. The district engineer has estimated $2,500 for that for the first year. On account of the cessation of battery construction work in the Philippine Islands early in the coming fiscal year it will be necessary to charge almost all of the overhead that is connected with the whole district to such maintenance items as may be done and that overhead will reach a considerable figure. It is necessary to maintain an office at Manila, and the organization there also contemplates the maintenance——

Mr. **Borland** (interposing). What kind of an office?

Col. **Wright**. An engineer office.

Mr. **Borland**. For the mere purpose of maintenance?

Col. **Wright**. A comparatively small force will have to be maintained, not very much of a force, but there will have to be some. The district officer there is also the department engineer.

Mr. **Borland**. You do not charge the district officer to this fund, do you?

Col. **Wright**. His office force will be charged to this in very large measure. The organization must also be maintained in order to be prepared for such work as may possibly be authorized in the future, for instance, if you gentlemen authorize this 12-inch long range battery, for which we have estimated. It is also necessary to maintain the floating plant in the district. The district has always possessed a tug and some seven or eight barges, which have been used in battery construction work. The necessity for this floating plant consists in the fact that all supplies for battery construction work have to be brought at least as far as from Manila, a distance of 30 miles. The sand for the concrete is secured in the Mariquina River, which is above Manila, and has to be towed a distance of 30 miles to the battery sites. The rock for the concrete is secured at a quarry on the mainland on the south side of Manila Bay and also has to be towed to the various batteries. Also on three of the islands there is no water supply; water has to be transported to all of them by means of barges, and all of these considerations have led to the maintenance by the office of a very considerable floating plant. At the present time the floating plant has been materially reduced due to the completion of battery construction, and the tug has been turned over to the Navy Department on an agreement which makes it possible for the district engineer to resecure her in case battery construction operations are reinstituted on a large scale.

Mr. BORLAND. What is the cost of the maintenance of that floating plant?

Col. WRIGHT. The maintenance and operation of the floating plant is estimated by the district engineer at $5,200. I can give you the exact estimate for that $50,000 if you would like to have it in the record.

Mr. BORLAND. We have two items pretty clearly in mind. One is the maintenance of the electrical equipment, $2,500, and this floating plant, $5,200. That accounts for $7,500.

Col. WRIGHT. Yes, sir.

Mr. BORLAND. The rest of it is for clearing your trails, general repairs and the maintenance of the batteries on the islands.

Col. WRIGHT. And the overhead expenses of the office.

Mr. BORLAND. How much are your overhead expenses?

Col. WRIGHT. The overhead expenses of the two offices are estimated at $9,600.

Mr. BORLAND. You intend to charge all of that to this fund?

Col. WRIGHT. It will be necessary to charge all of it to this fund unless battery construction operations are initiated, because we will be doing no other work.

Mr. BORLAND. In the past you have been charging that to battery construction?

Col. WRIGHT. Yes, sir.

Mr. SLEMP. What reduction in overhead expenses will there be?

Col. WRIGHT. On the completion of the battery construction?

Mr. SLEMP. Yes.

Col. WRIGHT. I would have to itemize salaries and things of that sort in order to answer that question, but I should say offhand that the reduction would be in excess of 50 per cent.

Mr. GOOD. Your estimate for putting in these emplacements for the 12-inch guns will not include, then, the expenses of maintaining these district offices.

Col. WRIGHT. In case that estimate is approved we will be able to charge some of the district office into it and will then be able to reduce our maintenance assignment by that much. But I do not mean to be understood as saying that the entire cost of the Manila and Fort Mills offices is $9,600; it is considerably in excess of that amount, but the proportion which it is contemplated to charge to maintenance is $9,600.

Mr. GOOD. And is that true in the event that the committee should give you the amount required to put in the emplacement, for the two 12-inch guns?

Col. WRIGHT. While it is not definitely stated, I should say, from what I know of the situation there, that it is true.

Mr. BORLAND. For the maintenance of the trails and the clearing of the reservations you have been accustomed to use the Coast Artillery enlisted personnel, have you not?

Col. WRIGHT. It has been used to some extent, but not very greatly, and I think quite a little of the Coast Artillery personnel has been withdrawn, has it not?

Col. HASE. No.

Col. WRIGHT. In any event it has not been used to any great extent on this work. The majority of that work has been done by convict labor, and payment for the services of the convicts made to the insular government.

Mr. BORLAND. You have been doing that out of the appropriation which you had?

Col. WRIGHT. Yes, sir; to the best of our ability.

SURVEYS TO LOCATE STRATEGIC ROADS IN CONNECTION WITH LAND DEFENSES, HAWAIIAN ISLANDS.

Mr. BORLAND. You had an item in the last bill "For surveys to locate strategic roads in connection with land defenses in the Hawaiian Islands, $10,000." What was done under that item?

Col. WRIGHT. The district engineer has expended only about $700 of that $10,000 item and has stated that the delay in starting those surveys has been due principally to the difficulty which he has had in securing the necessary transportation. That explanation is not entirely satisfactory to the Chief of Engineers and it is contemplated that he will be requested to explain that matter in more detail, because it would certainly seem that much more work should have been done than is apparently the case.

Mr. BORLAND. What is in view there? Are you laying out a system of roads all over the Hawaiian Islands?

Col. WRIGHT. There were two roads which, I think, were brought to the attention of the committee last year, and an attempt was made at that time to secure an appropriation for the initiation of construction. That appropriation was not granted but in its stead an item of $10,000 was included for surveys of these roads. The roads which are contemplated are from Diamond Head to Makapun Point and Waimanalo and from Moanalua Junction to Fort Kamehameha. The detailed estimate for those roads is in the neighborhood of $700,000 and $110,000 was asked for last year, which was included in the land defense estimate, but only $10,000 for the survey and apparently for the preparation of much more detailed estimates was appropriated.

Mr. BORLAND. And that $10,000 has not been used at all?

Col. WRIGHT. They have not gone very far into it, but why they have not done so I am not able to state satisfactorily.

Mr. BORLAND. The purpose was to construct these two main roads, one from Diamond Head?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. And what was the other one?

Col. WRIGHT. From Moanalua Junction to Fort Kamehameha.

LAND DEFENSES, HAWAIIAN ISLANDS, INCLUDING THE INSTALLATION OF SEARCHLIGHTS AND ACQUISITION OF LAND AND RIGHT OF WAY.

Mr. BORLAND. You had a request last year "For land defenses in the Hawaiian Islands, including the construction and repair of roads required for military purposes, the procurement and installation of searchlights, and the acquisition of land and rights of way, $225,000."

You have renewed this item, but you have changed the wording of it and cut out the part about roads for military purposes, so that the item reads:

> For land defenses in the Hawaiian Islands, including the procurement and installation of searchlights and the acquisition of lands and rights of way, $181,000.

You have also changed the amount slightly.

Col. WRIGHT. Yes, sir.

Mr. BORLAND. Does that mean you are not asking at this time for anything for the construction of roads?

Col. WRIGHT. Yes, sir. We are not asking anything for the construction of these two roads. It is our intention to make our surveys and get the information in shape for the committee before we come before it again with a request for money for those roads.

Mr. BORLAND. What is meant by "acquisition of lands and rights of way"; has that anything to do with the roads?

Col. WRIGHT. No, sir; that has to do with the acquisition of the sites for the land defense structures. Certain roads to provide access to these land defense structures are necessary, but those roads, as compared with these two main military roads on which we figured last year are comparatively inexpensive.

Mr. BORLAND. Last year you included the two military roads in this estimate?

Col. WRIGHT. Yes, sir; and this year we are not including them.

Mr. BORLAND. And your estimate for the acquisition of lands and rights of way does not refer to those particular military roads?

Col. WRIGHT. No, sir; not at all.

Mr. SLEMP. You want to make the survey, however?

Col. WRIGHT. We have that money already.

Mr. BORLAND. What is your plan about the land defenses?

Col. WRIGHT. The increase in the land defense estimate has been made on the basis of data which is submitted by the land defense board in the Hawaiian Islands. Those people are on the ground and of course know the situation much better than any one in this country can know it, and when a land-defense project has come through from the Hawaiian Islands approved by the department commander, and has passed through the War College, we do not feel that we should go over the heads of the people who are on the ground and know the conditions. The district engineer, as a result of alterations in the cost of material and of certain new conditions which were found in reviewing the land-defense project, has found it necessary to put in this increased item of $181,000.

Mr. **Borland**. Last year you asked for $225,000 for the land defenses, including the construction of these military roads, and it was not appropriated.

Col. **Wright**. No, sir.

Mr. **Borland**. You got $10,000 for a survey which, of course, has not been spent.

Col. **Wright**. That is correct.

Mr. **Borland**. Now, this item of $181,000 is practically a new item which is for land defenses, including the procurement and installation of searchlights. It is not a continuation of the former item, because the former item apparently was refused by the committee last year.

Col. **Wright**. The two roads have been stricken out of this estimate of $181,000.

Mr. **Borland**. Everything was stricken out except $10,000 for the survey.

Col. **Wright**. Yes; but we had previously had money for land-defense work. You will observe that the 1914, 1915, and 1916 appropriations for land-defense purposes were quite large, and with this $181,000 it is intended to go ahead and augment the work which was done under those three appropriations.

Mr. **Borland**. Was a certain program completed by the previous appropriation down to 1917?

Col. **Wright**. It is hard to say whether the program has been completed or not. The land-defense project in the Hawaiian Islands has apparently been revised by the local authorities quite a few times, and for me to say that the program was completed by those appropriations would, in all probability, be incorrect, because the extent of the program is not definitely fixed.

Mr. **Borland**. The reason I asked that question was because last year apparently the committee refused everything but the $10,000 for the survey of military roads, which would seem to indicate that the previous appropriations and the money you had on hand was sufficient to complete your program with the exception of the military roads. Now, what is the situation with reference to the $181,000?

Col. **Wright**. The estimate of $181,000 for land defenses in the Hawaiian Islands may be reduced by $15,580, which was included for the purpose of repairing eight 36-inch portable lights at present in the islands. It is contemplated that these repairs will not be made.

Mr. **Borland**. I understand this estimate is made up by the district board and transmitted to the War Department here and has been approved by the Board of Review in the War Department.

Col. **Wright**. The project has been approved by the Hawaiian land-defense board, and the department commander of the Hawaiian Department, and has been passed on and approved by the General Staff here. The estimates are made by the district engineer in Honolulu and are forwarded to the Chief of Engineers.

Mr. **Borland**. But there is no way of telling now whether this is the entire program of the land-defense board or not?

Col. **Wright**. No, sir. I do not think it is safe to say that at all.

Mr. **Slemp**. Do you expect to utilize the money you have asked for searchlights? Do you think those searchlights will be available?

Col. WRIGHT. We have made temporary preparations, sir, in this way: A letter was received about a month or six weeks ago from the district engineer in Honolulu stating that these eight 36-inch portable lights, the old ones to which we have previously referred, were in such a state that their condemnation was advisable, and that they should be entirely retired from service. We gave directions to him to acquiesce in their condemnation and have them retired from service. For temporary use in the Hawaiian Islands we have directed the engineer depot to ship to the district engineer at Honolulu four of the 24-inch portable lights, of which we have constructed quite a large number for use with the mobile army, and which have been found to be too small for the antiaircraft service in France, and are therefore available for use in this country. A large number of those lights are at Washington Barracks at the present time, and are being used in the instruction of troops who will go abroad and who will later handle the larger lights which we are shipping for use in France. The four 36-inch lights for the Honolulu project we will not be able to furnish, but the 24's are available.

Mr. SLEMP. How much of the money, then, is to be used for the procurement of the searchlights and how much for the installation?

Col. WRIGHT. The installation of these lights is practically nothing, because they are portable outfits and their generating sets accompany them.

Mr. SLEMP. I do not quite follow, then, why you need the money for the procurement of the searchlights.

Gen. ABBOT. To reimburse the appropriation. They were bought for France.

Mr. SLEMP. From the appropriation for engineer operations in the field?

Col. WRIGHT. As a matter of fact, sir, the purpose for which these lights were sent to the Hawaiian Islands is more to fill an immediate pressing need for searchlight illumination of some kind than with the idea that they will become part of the permanent project there. The lights which we have sent out are horse-drawn lights on what is known as limber and caisson type carriages.

Mr. SLEMP. How much will the four cost?

Col. WRIGHT. I should say offhand in the neighborhood of $30,000.

Mr. SLEMP. Then that would leave a balance of something like $70,000?

Col. WRIGHT. The total estimate for four 36-inch and four 24-inch lights was $86,680. These 24-inch lights which I am sending out there I do not wish at the present time, at least, to consider as the lights which are to be furnished for the final project, because we want to develop a light on an automobile mount for that purpose. We are sending these lights out there as a stop-gap pure and simple.

Mr. SLEMP. What I am trying to get at is whether you are going to be able to get any searchlights at all to fill your program.

Col. WRIGHT. In all probability we will not.

Mr. SLEMP. Therefore, there is no necessity for appropriating the money for it.

Col. WRIGHT. Your point is very well taken, I think, sir.

Mr. SLEMP. What would you suggest about that?

Col. WRIGHT. The net increase which is due to this searchlight project and the amount of that increase which is charged into this estimate of $181,000, which I am asking for at the present time, is only $1,280, on account of the fact that the eight searchlights which are included in the new project take the place of seven which were in the old project and have been eliminated, and the eight new searchlights cost only $1,280 more than the seven old ones.

PURCHASE AND INSTALLATION OF SEARCHLIGHTS FOR THE DEFENSES OF MOST IMPORTANT HARBORS IN THE HAWAIIAN ISLANDS.

Mr. Borland. Colonel, you have a new item here, as follows:

> For purchase and installation of searchlights for the defenses of most important harbors, as follows.
>
> In the Hawaiian Islands, $20,000.

Apparently this item has not appeared since 1914, five years ago, when you had $10,800.

Col. Wright. That is correct, sir.

Mr. Borland. Then I take it this is for the installation of new lights or for the replacing of old lights with lights of a new pattern; which is it?

Col. Wright. That is correct, sir, it is both. I would like to state my balances on the old appropriation before proceeding.

Mr. Borland. What is your balance under the old appropriation?

Col. Wright. On March 31, 1918, I had for the Hawaiian Islands searchlights no allotted balance, but an unallotted balance of $41,742.70. The work which it is proposed to do in the Hawaiian Islands is the reinstallation of four of the searchlights. Those searchlights when originally sent out to the Hawaiian Islands were placed on comparatively low sites at Fort De Russy and Fort Kamehameha, where, as you know, the ground is very slightly above sea level. It has been found in actually using the lights that their usefulness is very greatly curtailed by the fact that they are so low, and the rising of mist from the breakers reduces the range of the beams so much as to make them almost entirely useless. It is now intended to reinstall these four lights on elevating towers which will raise them to a height of about 75 feet above the ground level and will place them above the influence of this mist. It will also give them, of course, the advantages which come from increased height.

Mr. Borland. What is the cost of the work to erect those towers?

Col. Wright. That work is estimated at $48,500.

Mr. Borland. What is the balance of the $20,000?

Col. Wright. The balance of the estimate is to change over seven 60-inch lights which are at present utilizing the pure carbon arc, to the Sperry high-intensity arc. The cost is estimated at $1,800 per lamp, or $12,600 in all. The total cost of the new work which we thus wish to do is $62,100; my unallotted balance is $41,742.40, and I am now asking for $20,000 in order to fill out that unallotted balance and make it possible for me to do this work.

Mr. Borland. Suppose you can not get the Sperry lamps for that place?

Col. Wright. If I can not get them, sir——

Mr. Borland (interposing). You are going to put in 60-inch Sperry lights?

Col. Wright. We are going to put 60-inch Sperry lamps in the projectors which we already have out there.

Mr. BORLAND. Suppose you can not get them?

Col. WRIGHT. If we can not get them, sir, that amount of money can not be spent.

Mr. BORLAND. It would appear from your previous evidence about the demands for 60-inch Sperry lights that you will not be able to get them.

Col. WRIGHT. It may be that we will not be able to get them.

(See inserted statement regarding coast defense lights p. 113.)

PURCHASE AND INSTALLATION OF SEARCHLIGHTS IN MOST IMPORTANT HARBORS, PHILIPPINE ISLANDS.

Mr. BORLAND. What is the situation in the Philippines—is it similar to the situation in the Hawaiian Islands?

Col. WRIGHT. In the Philippine Islands our available allotted balance is $856.77 and the unallotted balance is $11,714.75, making the total cash available of date February 28, 1918, $12,571.52. The Philippines estimate is submitted with the idea of changing over eighteen 60-inch lights, which are now in the islands, to the Sperry system.

Mr. BORLAND. And does it involve the construction of towers?

Col. WRIGHT. No, it does not. The searchlights in the Philippine Islands are all permanently mounted at the present time, and most of them are on very high sites.

Mr. BORLAND. Your proposal is to use the unexpended balance and the new estimate of $33,000 entirely for the purpose of changing the existing searchlights to the Sperry type?

Col. WRIGHT. The new estimate will provide in itself for the Sperryizing of those lights, and the old amount, of $12,571.52, is not included in that. I would like to look up the status of the work in the Philippines and see what they propose to do. As far as I know that searchlight project is almost completed. There is still some question about light No. 1 at Fort Mills, Corregidor Island. Certain experiments are being carried on there with regard to the possibility of using a plane mirror to reflect the beam of the searchlight. A light has recently been installed with this plane mirror apparatus and is still in the hands of the Engineer Department, and it is probable that some small expenditures remain to be made in connection with that light.

Mr. BORLAND. How many lights did you say were in the Philippines?

Col. WRIGHT. Eighteen.

Mr. BORLAND. How much do you estimate it will cost to Sperryize those lights?

Col. WRIGHT. $1,800 each, or a total of $33,000.

Mr. BORLAND. What application do you make of the unallotted balance of $11,714? If I understood you correctly, the work of installation has been completed?

Col. WRIGHT. Yes, sir; with the exception of this No. 1 light, and from the data before me at present I should say that we could expend quite a lot of that unallotted balance on Sperryizing.

Mr. BORLAND. How much?

Col. WRIGHT. It is desirable, of course, to leave some money in the hands of the district officer in order to provide for small changes which frequently come up in connection with the searchlight installations, but I should say that perhaps $3,000 or $4,000 would accomplish everything that he would be likely to do.

Mr. BORLAND. How many lights do you say there were in the Hawaiian Islands?

Col. WRIGHT. There are seven 60-inch and two 36-inch.

Mr. BORLAND. And your ability to do the work in both of these places is dependent upon your ability to get Sperry lights?

Col. WRIGHT. Entirely.

Mr. GOOD. I understood you were having trouble in deliveries on the Sperry lights for fortifications owing to the demands from Gen. Pershing?

Col. WRIGHT. That is quite true; we have not been able to get new projectors for fortifications at all.

[See inserted statement regarding coast-defense lights.]

Mr. GOOD. You are asking for 225 for the purpose of the antiaircraft guns, to be placed at certain points in the United States.

Col. WRIGHT. Yes, sir.

Mr. GOOD. In view of the demand for this very kind of a light, not only from Gen. Pershing but the other demands that you have already detailed, what serious harm would there be to allow this matter to go over for another year?

Col. WRIGHT. The whole estimate on coast-defense lights is based on the possibility that we may be able to increase our production in the period from October 1, 1918, to July 1, 1919, sufficiently to provide for the antiaircraft lights for Gen. Pershing's requirements and have lights left over for coast-defense purposes.

Mr. GOOD. Suppose you were not able to do that?

Col. WRIGHT. If we were not able to do that the coast-defense lights will be the third choice.

Mr. GOOD. They are third in importance.

Col. WRIGHT. Yes, sir.

Gen. ABBOT. If we have the money and we find we can get the lights we will get them, but if we do not have the money, and we have a chance to get the lights we will have to wait; that is the whole crux of the situation.

Mr. GOOD. Some of these searchlights are placed at points where you have guns of relatively small caliber in the Philippines and in the Hawaiian Islands?

Col. WRIGHT. Yes, sir.

Mr. GOOD. Where you are using a gun of small caliber, does not your old searchlight give fairly good results, so far as the length of the beam is concerned?

Col. WRIGHT. We are desirous at the present time of attempting to standardize our searchlight installation by using uniformly the 60-inch Sperry light, and we think that will not only result in much better illumination of targets for the Coast Artillery and be much more satisfactory to them, but will also very greatly simplify our problem of the issue of spare parts and supplies and the problem of maintenance by providing a homogeneous installation for the coast defenses. That is what we are trying to secure.

MAINTENANCE AND REPAIRS OF SEARCHLIGHTS, ELECTRIC LIGHTS, AND POWER PLANTS, HAWAIIAN ISLANDS.

Mr. BORLAND. The next item is "For maintenance and repair of searchlights and electric light and power equipment for seacoast fortifications, and for tools, electrical, and other supplies, and appliances to be used in their operation at the following localities." The first is the Hawaiian Islands, $2,500.

Col. WRIGHT. Yes, sir.

Mr. BORLAND. That is the amount you have been having for the last two years.

Col. WRIGHT. Yes, sir.

Mr. BORLAND. What balance have you on hand, if any?

Col. WRIGHT. Of the $2,500 which was appropriated last year for supplies in the Hawaiian Islands we had on March 31, 1918, $103.51, and at that time there were outstanding obligations approximating $2,000. A deficiency estimate of $2,500 has been submitted under this item and also a supplemental estimate for $2,500.

Mr. BORLAND. You mean there are three estimates in, the regular estimate, the deficiency estimate, and the supplemental estimate?

Col. WRIGHT. Yes, sir; three estimates for the Hawaiian Island supplies. The regular estimate is $2,500.

Mr. BORLAND. The supplemental estimate does not seem to be before the committee.

Col. WRIGHT. It was submitted, sir, through the Secretary of the Treasury some time ago.

Mr. GOOD. You mean you are asking for $5,000 for the next fiscal year?

Col. WRIGHT. Five thousand dollars for the year in which we are now and $5,000 for 1919; yes, sir.

Mr. BORLAND. What is the explanation of that increase from $2,500 last year to $7,500 this year?

Col. WRIGHT. It is not $7,500 this year. Two thousand five hundred dollars of that is represented by the deficiency estimate, which is practically all obligated now.

Mr. BORLAND. Then your expense for the current year is approximately $5,000?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. And you are asking $5,000 for this year?

Col. WRIGHT. That is the status; yes, sir.

Mr. BORLAND. What is the explanation of that increased cost of maintenance?

Col. WRIGHT. The amount which we have had has not been entirely sufficient in the past, and on account of the commencement of the war our use of supplies has very greatly increased, especially with respect to the operation of the searchlights and the 25 kilowatt sets that go with them.

Mr. BORLAND. Are you using the searchlights in those harbors to a greater extent during the war than you did previous to the war?

Col. WRIGHT. To a very much greater extent; yes, sir.

Mr. BORLAND. And in the same way in which you use them in American harbors?

Col. WRIGHT. Yes, sir. I may instance that in Manila Bay the practice previous to the commencement of the war was to hold a searchlight drill of, perhaps, two hours or two hours and a half in duration twice a week; since the commencement of the war it has been customary to burn four lights all night and every night.

Mr. BORLAND. This increased estimate is not due or dependent upon your program for changing those searchlights?

Col. WRIGHT. No, sir; it applies to the existing searchlights.

MAINTENANCE AND REPAIR OF SEARCHLIGHTS, ELECTRIC LIGHT AND POWER EQUIPMENT, ETC., PHILIPPINE ISLANDS.

Mr. BORLAND. What is the condition in the Philippines? Have you any supplemental estimate there?

Col. WRIGHT. No, sir; but, if you will observe, we have jumped our regular estimate quite considerably

Mr. BORLAND. From $5,000 to $12,000?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. What is your balance under the estimate of 1918?

Col. WRIGHT. In 1918 we had, on February 28, $162.38.

Mr. BORLAND. Had you any deficiency?

Col. WRIGHT. I would not say that a deficiency existed at that time, but since then the district engineer has forwarded artillery requisitions which aggregate very considerable sums with the statement that he had no money which could be applied to fill these requisitions and with the request that funds be secured, if possible, in this country and that they be filled.

Mr. BORLAND. How is your estimate of 1919 made up?

Col. WRIGHT. The estimate of 1919 is based on the fact that the estimate for 1918 has proved insufficient, on the fact that the war conditions will in all probability continue, which will require increased expenditures, and on the fact that there will be turned over to the artillery for use and care the most extensive power plant and electrical and mechanical installation in the harbor, which will require a very considerable amount in the way of supplies.

Mr. GOOD. Will you need all of that $12,000 for next year?

Col. WRIGHT. We think we will; yes, sir.

Mr. GOOD. Do you know from the reports received from the district officer just what your expense will have been for this year, or approximately?

Col. WRIGHT. In order to get that I would have to investigate a great many expenses that were incurred in connection with battery construction. The power plant in question has not been operated in the past at the rate at which it will be operated in the future, and has been in the hands of the Engineers, being operated entirely from battery-construction money. We are now turning it over to the artillery or will do so very shortly after the commencement of the fiscal year, after which the supplies for it will have to come from this appropriation.

CONSTRUCTION OF SEA WALL AND EMBANKMENT, HAWAIIAN ISLANDS.

Mr. BORLAND. The next item is "For construction of sea wall and embankments, Hawaiian Islands, $12,500." You had for the current year $10,000. What is the condition of your balances?

Col. **Wright**. We have nothing on hand, sir.

Mr. **Borland**. What is the basis of your estimate of $12,500 for this year?

Col. **Wright**. The estimate is intended for the construction of a sea wall and the placing of a fill for the protection of batteries Barri and Chandler at Bishops Point.

Mr. **Borland**. This is for the construction of a sea wall at Bishops Point, you say?

Col. **Wright**. Yes, sir.

Mr. **Borland**. That is at the entrance to Pearl Harbor?

Col. **Wright**. Yes, sir.

Mr. **Borland**. Is this the total estimate for that sea wall?

Col. **Wright**. It is the total estimate; yes, sir.

Mr. **Borland**. Has that been recommended and passed upon by the board of defense out there? Is that within their jurisdiction?

Col. **Wright**. I do not think that comes within their jurisdiction.

Col. **Hase**. The necessity for this sea wall is that the sea makes incursions there and undermines the battery and it is in danger of toppling into the sea. It is a land-defense battery and not a coast-defense battery.

Col. **Wright**. Conditions have been changed there by the completion of a new and deeper channel into Pearl Harbor, giving the sea greater access to it.

CONSTRUCTION OF MINING CASEMATES, CABLE GALLERIES, ETC., FOR SUBMARINE MINES, PHILIPPINE ISLANDS.

Mr. **Borland**. You have an item here for the construction of mining casemates, cable galleries, etc. Year before last you had $10,000 in Hawaii. Has that amount been used up?

Col. **Wright**. I have the appropriations for the insular possessions generally, sir, and my balance on March 31, 1918, was $97.45.

Mr. **Borland**. This year you are asking $140,000 for the Philippine Islands and nothing for Hawaii?

Col. **Wright**. Yes, sir.

Mr. **Borland**. What is the basis of that $140,000 estimate?

Col. **Wright**. The $140,000 is based on the construction at Fort Hughes of a new reinforced concrete wharf, which is to be used largely for mine purposes. The existing wharf is a temporary wharf which was built by the Engineer Department for use in the construction of the batteries. That wharf has been in use for some years, ever since the initiation of battery construction. It is in a very bad state at the present time. On account of the deterioration of timber in that country it is very desirable that it be replaced by a permanent wharf, and on account of the fact that part of the mine defense of Manila Bay is operated from the Fort Hughes casemate, it is necessary that we have the wharf there.

Mr. **Borland**. How long will it take you to build a concrete wharf?

Gen. **Abbot**. I do not know the plans or the size of it, but it can be done practically as fast as a timber wharf.

Mr. **Borland**. Well, approximately what time?

Gen. **Abbot**. It ought to be done inside of a year without any trouble, I should think.

Mr. BORLAND. Material and labor are even higher and scarcer in the Philippines than with us here.

Gen. ABBOT. I do not know the existing conditions.

Col. WRIGHT. The sand and rock can be secured readily enough, but the cement will be a different proposition.

Mr. BORLAND. What do you know about the existing wharf? Is it serviceable at this time?

Col. WRIGHT. I do not think it is. We used to have trouble with that wharf right along and our boat was injured several times by coming in contact with loose piles around the existing wharf. Last year, when it was necessary to land heavy guns for the batteries, they feared for the safety of those guns by reason of the bad condition of the wharf.

Mr. BORLAND. But they would not have to do that again.

Col. WRIGHT. No such weight as those guns will ever be placed on the wharf again, but it was in a very bad state at that time, and they considered themselves very fortunate to get by with those guns. I might say that we got an appropriation on March 28, 1918, in the deficiency act, for $40,000 for casemates, of which you apparently have no record.

Mr. BORLAND. Where was that, in the Philippines?

Col. WRIGHT. No, sir; that was for Honolulu, and was intended for the bomb-proofing and general protection of the mine casemate at Fort Kamehameha. The amount is not allotted on account of the fact that the plans submitted by the district engineer were deficient in a few minor details and have been returned to him with directions to comply with instructions which the Chief of Engineers has given in regard to the plans. As soon as he submits revised plans the allotment will be made and the work will proceed.

Mr. GOOD. Colonel, it is not proposed to build a new wharf, is it?

Col. WRIGHT. Yes, sir; an entirely new wharf. The existing wharf is a timber structure.

Mr. GOOD. You do that under the language "and other structures necessary for the operation."

Col. WRIGHT. Yes, sir; this wharf is necessary because vessels must be able to get in there.

Mr. GOOD. You are not asking this under the language "for providing channels for access to torpedo wharves at the defenses?"

Col. WRIGHT. No, sir; this is the wharf itself.

Mr. GOOD. As I understand it, practically the entire amount is intended for the building of the wharf?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. You have another new item, as follows:

PROCUREMENT OR RECLAMATION OF LAND NEEDED FOR FORTIFICATIONS AND COAST DEFENSES, HAWAIIAN ISLANDS.

For procurement or reclamation of land, or right pertaining thereto, needed for the site, location, construction, or prosecution of works for fortifications and coast defenses in the Hawaiian Islands, $150,000.

What is the purpose of this estimate?

Col. WRIGHT. This is for the purchase of the sites for two long-range batteries.

Mr. BORLAND. You have not acquired the land?

Col. WRIGHT. No, sir; we have not acquired the land for those two batteries. The work on the other battery, you will remember, is proceeding.

Mr. BORLAND. Yes; you said you had started on that battery and had started your railroad down there and put down some piles, and so on, and this is for the other two.

Col. WRIGHT. Yes, sir.

Mr. BORLAND. How long will it take you to acquire this land?

Col. WRIGHT. The district engineer states that the land can be acquired within the estimate of $150,000. I have not definite information further than his statement as to that. If the committee desires I will get further information from the district engineer and insert it in the record.

Mr. BORLAND. Is the land under option or is it proposed to condemn it?

Col. WRIGHT. From the information we have, I should say it was contenplated to purchase it, but our advices are not at all complete.

Mr. BORLAND. You have no means of knowing whether they have reached an agreement as to the price or not?

Col. WRIGHT. Not now; no, sir; except the statement of the district engineer officer that he could get the sites within the appropriation.

Mr. BORLAND. It seems to me we ought to have information as to when he can get it.

Col. WRIGHT. I can cable for that information this afternoon and present it to the committee as soon as it is received.

Mr. GOOD. How much land is it proposed to acquire there, Colonel?

Col. WRIGHT. The exact acreage I can not tell you.

Mr. GOOD. It must be a rather large tract, judging from the price.

Col. WRIGHT. Yes; that estimate does seem large.

Gen. ABBOT. It provides area for the garrison buildings and things of that kind.

Mr. GOOD. What is proposed in that regard?

Gen. ABBOT. I have not the figures as to the acreage of these particular lots at all.

Mr. GOOD. Is it your understanding that the plan contemplates the building of quarters for troops at each of these places?

Gen. ABBOT. Not out of this fund, but the Engineers provide land sufficient for the accommodation of the batteries and of the necessary appurtenant structures which are to be built by the Quartermaster Department. That was not always the case. That has varied from time to time. At first we did that and then we were told to buy only sufficient for the batteries, and that made it necessary for the Quartermaster Department to buy land afterwards and the prices always went sky high, so our last instructions were to buy enough land for the accommodation of all the military necessities at one of these seacoast defenses at the time we made the original purchase of land.

Mr. GOOD. If the plan contemplates the purchase of a sufficient amount of land to provide quarters for troops, what would be the minimum requirement in acreage?

Gen. ABBOT. It depends very much on the character of land. For instance, if there was a large swamp we might have to buy the swamp in order to get high land enough for the barracks.

Mr. GOOD. And you are not familiar enough with the character of this place to state?

Gen. ABBOT. No, sir; except we know that the locations generally are low.

Mr. GOOD. Is it proposed to acquire these sites by condemnation or by purchase?

Gen. ABBOT. If we can get reasonable prices we prefer to buy without condemnation, but in case there is evidence that there is going to be an attempt to hold us up for high prices, then we can condemn and take immediate possession under the terms of a recent act.

Mr. GOOD. But you do not know what the facts are in these two particular cases?

Gen. ABBOT. No, sir; I do not. It is so far off we can not get the information in all cases as fully as we want it in time.

Mr. GOOD. A few years ago an item was carried in the fortification bill providing that before any appropriation or estimate was made for any emplacement or fortification, detailed plans should be drawn and submitted. Have the plans all been drawn with regard to these two places where it is now proposed to put in emplacements?

Col. WRIGHT. The batteries which are to be built are built after plans which have been prepared by the Board of Engineers in New York, as I have previously stated. Those plans are in detail. The district engineer, however, must in each instance fit his battery to the particular site on which he is to place it.

Mr. GOOD. Do those plans go to the extent of providing quarters for the troops?

Col. WRIGHT. As I think we said day before yesterday, that is a question of the sites. In case a parados or extra structure is needed for the protection of the rear of the batteries, or some other construction of a like nature, it is customary to utilize it for quarters for troops.

Mr. GOOD. And you do not know what the plans show in that respect?

Col. WRIGHT. No, sir.

Mr. BORLAND. I wish you would procure for the committee information from the district engineer as to whether he has this land under option and in what length of time he thinks it can be purchased.

Col. WRIGHT. Yes, sir.

NOTE.—Information received by cable regarding these sites is so indefinite as not to warrant its transmission to the committee. A full report is now enroute and will be communicated as soon as received.—J. M. W.

PURCHASE, MAINTENANCE, REPAIR, AND OPERATION OF AUTOMOBILE—HAWAIIAN ISLANDS.

Mr. BORLAND. "For maintenance, repair, and operation of one automobile, expenditures are authorized to an amount not exceeding $900 during the fiscal year 1919, from funds available from appropriations for fortifications in the Hawaiian Islands."

Col. WRIGHT. As it stands, the item is for the maintenance, repair, and operation of one automobile, and expenditure is authorized to an amount not exceeding $900, during the fiscal year ending June 30, 1919, from funds available from appropriations for fortifications

Col. WRIGHT. No, sir; we have not acquired the land for two batteries. The work on the other battery, you will rem is proceeding.

Mr. BORLAND. Yes; you said you had started on that batt had started your railroad down there and put down some pi so on, and this is for the other two.

Col. WRIGHT. Yes, sir.

Mr. BORLAND. How long will it take you to acquire this l

Col. WRIGHT. The district engineer states that the land acquired within the estimate of $150,000. I have not defini mation further than his statement as to that. If the com desires I will get further information from the district engin insert it in the record.

Mr. BORLAND. Is the land under option or is it proposed demn it?

Col. WRIGHT. From the information we have, I should say contenplated to purchase it, but our advices are not at all con

Mr. BORLAND. You have no means of knowing whether they reached an agreement as to the price or not?

Col. WRIGHT. Not now; no, sir; except the statement of district engineer officer that he could get the sites within the ap priation.

Mr. BORLAND. It seems to me we ought to have information a when he can get it.

Col. WRIGHT. I can cable for that information this afternoon a present it to the committee as soon as it is received.

Mr. GOOD. How much land is it proposed to acquire there, Colon

Col. WRIGHT. The exact acreage I can not tell you.

Mr. GOOD. It must be a rather large tract, judging from the pri

Col. WRIGHT. Yes; that estimate does seem large.

Gen. ABBOT. It provides area for the garrison buildings and thin of that kind.

Mr. GOOD. What is proposed in that regard?

Gen. ABBOT. I have not the figures as to the acreage of these pa ticular lots at all.

Mr. GOOD. Is it your understanding that the plan contemplat the building of quarters for troops at each of these places?

Gen. ABBOT. Not out of this fund, but the Engineers provide lan sufficient for the accommodation of the batteries and of the necessar appurtenant structures which are to be built by the Quartermast Department. That was not always the case. That has varied fro time to time. At first we did that and then we were told to buy onl sufficient for the batteries, and that made it necessary for the Quar termaster Department to buy land afterwards and the prices alwa went sky high, so our last instructions were to buy enough land for th accommodation of all the military necessities at one of these seacoa defenses at the time we made the original purchase of land.

Mr. GOOD. If the plan contemplates the purchase of a sufficien amount of land to provide quarters for troops, what would be th minimum requirement in acreage?

Gen. ABBOT. It depends very much on the character of land. For instance, if there was a large swamp we might have to buy the swamp in order to get high land enough for the barracks.

WRIGHT. No

BASE, MAINTEN

BORLAND.

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in the Hawaiian Islands. The district engineer writes us in part as follows with regard to this automobile:

> The automobile in use by this district is of an obsolete type, a Maxwell Special. the manufacture of which has been discontinued. It has been in service six years, It is impossible to procure locally the necessary repair parts and to get them from the States is becoming more and more difficult, and can not be done in any reasonable length of time, owing to the fact that the agency in San Francisco no longer keeps the parts. This necessitates laying up the car for weeks at a time. An automobile is an absolute necessity for the proper supervision of the work in progress. Authority is requested to dispose of the old car upon the best terms available and to purchase a new one at a cost not to exceed $1,250. Payment is to be made (*a*) from funds in hand for the operation of the automobile after reserving a sufficient amount for the operation of the new car until the expiration of the fiscal year; (*b*) from the amount received from the sale of the old car; (*c*) and the balance from the appropriation for battery construction, Hawaiian Islands, for six 12-inch long-range guns.

Mr. BORLAND. Colonel, why was not that put in the form of an estimate with a recommendation from the department if you wanted us to consider it?

Col. WRIGHT. It should have been so placed. This letter, however, was received after the estimates were submitted. The estimates were submitted, I think, last September or October, and this letter is under date of December 20.

Mr. BORLAND. That is a matter that applies to the department and their recommendation ought to come to us and then we would decide whether we want to consider it or not.

Col. WRIGHT. The definite recommendation of the department on the estimate is that the language which you have in your book be modified to read as follows:

> For the purchase, maintenance, repair and operation of one automobile, expenditures are authorized to an amount not exceeding $2,150 during the fiscal year ending June 30, 1919, from funds available from appropriations for fortifications in the Hawaiian Islands.

Mr. GOOD. How did you get along with your appropriation for repairs and operation of the automobile last year?

Col. WRIGHT. The balance available April 1, 1918, was $598.27. and I should like to state in that connection that the district engineer says that the automobile was laid up for repairs December 10, 1917. for an indefinite period. The manufacture of this machine was discontinued several years ago, and repair parts can not be procured locally and can not now be had as formerly from San Francisco, and such parts as can be had at all must now be procured from New Castle. Ind.

ADOPTION OF SPERRY HIGH-INTENSITY SEARCHLIGHT.

Mr. BORLAND. Is there any other item in the bill in which you are interested?

Col. WRIGHT. There is one more point which I would like to bring to the committee's attention in connection with the discussion of searchlights yesterday. The answers which I gave to certain questions which Mr. Slemp asked me indicated that the Engineer Department had been advised by the Chief of Coast Artillery in November. 1916, that the Sperry lamp was desired for future installation in the coast defenses, and that no steps had been taken by the Engineer Department to comply with this demand until August, 1917. Mr. Slemp made the point that that seemed to an entirely unreasonable delay and one very discreditable to the department, in which I quite agree with him. I have had that matter investigated and I find that the actual delay was very much less than appears from the questions which were asked yesterday, and I should like to have the permission of the committee to insert in the record a statement of exactly what was done in connection with that recommendation of the Chief of Coast Artillery.

Mr. BORLAND. There is no objection to that.

Statement regarding the adoption of the Sperry high-intensity searchlight for coast defense use and the manner in which the productive capacity of the United States as regards searchlight matériel has been utilized.

The competitive tests between the Sperry high-intensity light and the pure carbon arc searchlight previously used for coast defense purposes were completed by the Coast Artillery Board November 9, 1916. In consequence of these tests the board recommended that all 60-inch projectors then in service be modified by the substitution of the Sperry lamp for the General Electric Co.'s lamp previously used, and that no new projectors be purchased until the completion of competitive tests between the Sperry high-intensity projector and the Beck high-intensity projector. These recommendations were concurred in by the Chief of Coast Artillery November 14, 1916, and were received by the Chief of Engineers on that date. The competitive tests between the Sperry light and the Beck light were conducted by the Coast Artillery Board during the period November 20–28, 1916. In consequence of these tests the Coast Artillery Board recommended that in the installation of searchlight projectors in future and until a more suitable type of projector can be developed, the Sperry lamp be used either in a modification of the 60-inch General Electric projector previously used or in a similar projector of some other suitable type. These recommendations of the Coast Artillery Board were approved by the Chief of Coast Artillery, the Chief of Engineers being notified of that fact for the first time by indorsement of January 3, 1917, from The Adjutant General forwarding letter of the Chief of Coast Artillery, dated December 30, 1916.

Acting upon the previous recommendation of the Chief of the Coast Artillery that certain General Electric projectors then in service should be modified to receive the Sperry high-intensity lamp, the Chief of Engineers on December 13, 1916, instructed the general engineer depot to submit promptly an estimate for remodeling 50 searchlights (approximately one-half of the lights then in the coast defenses) by equipping them with Sperry lamps. After some negotiation with the Sperry company, the general engineer depot on January 29, 1917, entered into contract with that company for remodeling 50 of the old projectors. Some time was taken up in correspondence between the general engineer depot and the Sperry company regarding interpretation of certain terms in this contract, and this correspondence delayed until March 9, 1917, the forwarding of the contract to the Chief of Engineers for approval. When received by him it was returned to the general engineer depot for the correction of certain informalities, and was on March 22, 1917, finally approved. Deliveries under the contract commenced July 7, 1917, and were completed January 19, 1918. A second contract for the modification of seventy-five 60-inch projectors has since been entered into with the Sperry company and deliveries of lamp mechanisms under this contract are now in progress.

At the present time, and for some months past, the ability of the Sperry company to produce high-intensity lamp mechanisms has been in excess of the ability of the manufacturers of projectors and mirrors to produce material in which these lamp mechanisms might be installed. It has therefore been possible to apply to coast-defense purposes 50 high-intensity lamp mechanisms without in any way impairing the supply of searchlight equipment to the American Expeditionary Forces. It is expected that it will also be possible to apply to coast-defense purposes the 75 high-intensity lamp mechanisms now under order without affecting the shipment of searchlight material to France. However, no new projectors have been supplied to the coast defenses and none will be so supplied until the demands of the American Expeditionary Forces and of the antiaircraft program previously laid down have been met.

In view of the above remarks, inquiry may be made as to why projectors have not been removed from the coast defenses, modified to receive the Sperry lamp mechanism and sent abroad to meet urgent needs of the American expeditionary forces. This course has not been pursued, for the following reasons:

A. The searchlight projects in the coast defenses of the continental United States are all in an incomplete state and the withdrawal of any lights from the defenses would undoubtedly result in imposing serious limitations upon the armament as regards its use for night action.

B. The coast-defense lights are all fitted with an expensive distant-control mechanism which is necessary for coast-defense purposes, but has been found worse than useless in France. This mechanism could, of course, be removed, but the removal would be expensive and would also involve a certain amount of delay.

C. Even after the removal of the electric-control apparatus the coast-defense projectors would still be considerably heavier than is desirable for use with the portable mounts which are being sent abroad. Owing to the difficulty of securing promptly quantity production of a projector of radically different design, it has been necessary to send abroad for use with portable mounts some projectors manufactured upon coast-defense patterns. It is desired, however, to reduce the number of such projectors to a minimum, and only enough lights of this pattern have been shipped to provide for very urgent needs. A new and lighter type of projector will shortly be put into production, and, subsequent to the procurement of a sufficient number of this new type, no more lights of the coast-defense model will be sent to France.

WEDNESDAY, MAY 15, 1918.

MAINTENANCE OF COAST ARTILLERY WAR INSTRUCTION MATÉRIEL, AT COAST ARTILLERY POSTS.

STATEMENTS OF BRIG. GEN. JOHN D. BARRETTE, ACTING CHIEF OF COAST ARTILLERY; COL. W. F. HASE, AND COL. C. E. BRIGHAM, ASSISTANTS.

Mr. BORLAND. For the maintenance of Coast Artillery war instruction matériel at Coast Artillery posts, etc., you had in the current bill $750 and you are asking this year for $1,250. What is the state of your balances?

Col. BRIGHAM. The unexpended balance is $304.93. That was of date January 31 and that was the last balance we have on that item, but it is practically all expended. The disbursing officer at the Coast Artillery school at Fort Monroe keeps the books on that, and we have to write to him in order to get the balances.

Mr. BORLAND. What is included under this item? What class of supplies?

Gen. BARRETTE. The class of supplies listed on page 16 in that table.

Mr. BORLAND. They are simply the accessories for that Coast Artillery school?

Gen. BARRETTE. Yes; they have such schools at all of the coast-defense stations.

Mr. BORLAND. What is the explanation of this increased amount?

Gen. BARRETTE. There are so many more under instruction and the expendable articles are increasing in cost.

Mr. BORLAND. What has been the increase in the number of pupils?

Gen. BARRETTE. I should say that the number has trebled.

Mr. GOOD. I notice you propose to eliminate this language, "and for extra-duty pay to soldiers necessarily employed for periods not less than 10 days." What is the object of that?

Gen. BARRETTE. My impression is that it is not allowed in time of war; I think it is cut out for everybody.

Mr. GOOD. In what position would you be if we eliminated that language from the bill and the war should terminate before the end of the fiscal year, 1919? Then you would not be authorized to use any portion of the money for extra duty pay and yet you might want to use it.

Gen. **Barrette.** That is possible; yes, sir.

Mr. **Good.** It would not do any harm to leave it in, would it?

Gen. **Barrette.** I would not say.

Col. **Brigham.** The disbursing officer might feel that the wording having been left in the bill he would be allowed to make the expenditures and then they might be disallowed by the auditor.

Mr. **Borland.** That is his lookout, if he disobeys the law.

Col. **Brigham.** But the disbursing officer would be justified in doing that if the wording were left in the bill.

Mr. **Good.** That is the law now and yet you are not allowing any extra-duty pay, are you?

Col. **Brigham.** I think not.

Mr. **Borland.** In other words, you have that authority under the current act, but because of the declaration of war you do not use that authority if it is against the law.

Col. **Brigham.** No, sir; I do not imagine the disbursing officer makes payments for extra-duty pay if it is against the law.

CONTINGENT EXPENSES INCIDENT TO CONSTRUCTION OF SEACOAST FORTIFICATIONS.

(See p. 86.)

Mr. **Borland.** In the deficiency act approved June 15, 1917, you were granted $1,000,000 for contingent expenses incident to the construction of seacoast fortifications and their accessories.

Col. **Brigham.** Yes, sir.

Mr. **Borland.** Is that the first time this contingent item was carried?

Col. **Hase.** Yes, sir.

Mr. **Borland.** And that is the only appropriation you have had for contingent expenses?

Col. **Hase.** Yes, sir.

Mr. **Borland.** What is the condition of that fund?

Col. **Brigham.** There has been allotted to the Chief of Engineers $377,033.60, to the chief signal officer $49,907.73, to the Chief of Ordnance $91,425, and a miscellaneous allotment of $10,244.34, making a total of $528,610.67, leaving a balance under the control of the Chief of Coast Artillery of $471,389.33.

Mr. **Borland.** By whom are those allotments made—by the Chief of Coast Artillery?

Gen. **Barrette.** Yes, sir.

Mr. **Borland.** The Chief of Engineers testified that he used a part of that money in maintaining the sea wall at Sandy Hook. We did not ask him what he used the balance for because we did not have the figures before us at that time.

Col. **Hase.** I have a statement here showing exactly what the items were for which the allotments were made.

Mr. **Borland.** I wish you would give them to us.

Col. **Hase.** The first item pertained to some emergency work which arose at Fort Hughes, P. I., and also at Fort Mills, P. I., and an allotment of $10,000 was made to the Chief of Engineers to carry on that work. The work at Fort Hughes consisted in the construction of cable huts or cable terminals where the submarine mine cables [illegible] completely [illegible] allotment [illegible] constructed [illegible] carriage had [illegible] carriage [illegible] emplace- [illegible] had been [illegible] allotment of [illegible] personnel man- [illegible] addition there was [illegible] vans Island. That work required some excavating, cutting down the walls of the old fort, both at Fort Sumter and also at Fort Moultrie, and the final construction of frame buildings which are covered with galvanized iron. On May 8 we had a request for an additional $3,000, inasmuch as the work could not be completed under the first allotment, so that the total allotment due to that work was $25,050. There was an allotment of $25,000 for the construction of platforms for eight antiaircraft guns at Panama. These mounts reached there early in October and the guns were expected in November. The platforms for the guns are emplaced at the three locks on the Atlantic side and one at Cristobal in the positions which were selected by the board of officers, of which the coast-defense commander was the president.

There was an allotment of $9,300 for the emplacement of three 4.7-inch guns at San Juan, P. R.. If you remember, when the German ship which was interned there tried to leave the harbor they had difficulty in stopping her. The Governor of Porto Rico immediately recommended that some steps be taken to provide some medium-caliber guns, and three guns from the Augusta Arsenal were ordered shipped there. The Engineers provided that installation, and they are mounted in three separate emplacements and are installed to cover the entrance of the harbor and also the large naval radio station there. Six hundred dollars for the temporary installation of six 15-foot coincidence range finders at Panama for use in 6-inch batteries. Sixty thousand dollars to repair the damaged sea wall at Fort Hancock, N. J., that we heard about yesterday. Two hundred and fifty dollars to permit a door to be cut in the land-defense wall which is constructed behind Fort Sherman at Panama. The new officers' quarters are built outside of the wall, and in order that they might reach the batteries quickly and in order that the guard might respond promptly to a fire disturbance or burglar alarm in the officers' quarters a gateway was cut in this wall. One thousand eight hundred dollars for the construction of two concrete gun blocks at Grays Harbor, Washington, and the purchase of sites for those two guns.

The construction work amounted to $1,500, while the cost of the sites was $300. This is in accordance with the recommendations of the board of review, that these two 5-inch guns should be taken from Fort Flagler and installed at Grays Harbor. Seventy thousand dollars for the cost of a wharf at Outer Brewster, which was purchased to provide for the installation of searchlights to cover the outer water areas of the main channel at Boston, and to provide for stations to supply data for the mortar batteries at Fort Andrews. Before any work could be done at Outer Brewster the engineers had to construct a wharf, and the estimated cost was $70,000. The allotment of $225 to procure land for the installation of two 4.7-inch guns at Sachuest, at the Sakonnet River, which is to the eastward of Newport. The Navy Department feared that an attack by one of these high-powered submarines might reach the naval utilities at Newport. The only guns that we now have in the permanent fortifications at Newport which cover that area are 12-inch mortars, and mortars are not of very great value against such a small target as a submarine, so that we took some 4.7-inch guns and installed them on private property at Sachuest, the rental of which is $150 a year; the damage to crops this year is $75, so that we are paying this year $225 for the piece of property on which those 4.7-inch guns are landed ashore and carried from there through conduits to the mining casemates; then there was the temporary lighting of the mine wharves at Fort Mills, the redecking of the mine wharf at Fort Mills, and also the purchase of small flat cars for handling submarine mine material. The total allotment was $10,000. The second item was for the construction of wire fences around some of the utilities at Panama and the construction of platforms for the 4.7 howitzers. This work was considered of such urgent necessity that the local engineer officer paid for it out of the appropriation for the Panama fortifications, and this allotment was to reimburse that appropriation, the sum being $26,048.60. Another allotment was made to the Chief of Engineers to defray the cost of the construction of wire fences around the fire-control stations at Panama, $18,400. The fire-control stations at Panama are very much isolated, being off in the jungle, and the idea was to build around these stations wire fences similar to those that they use in front of the trenches abroad; they are of barbed wire with an overhang on the front so that no one can go in and damage those outlying stations.

It would be absolutely impossible to keep a local guard at each one of the stations because they are so scattered. These fences are about 100 feet in front of the stations. Another item was for the purpose of defraying the cost of constructing wire fences around the stations, batteries, and utilities at Panama. When I say "utilities," I mean the powerhouse at Gatun, around the locks, and wherever the canal has any utilities that in any way make the canal operative. The total amount there was $29,800. Another item of $60,000 was for the purchase of 18.38 acres of land at North Hill, Fischer's Island, N. Y. This is in accordance with the Board of Review's project which contemplates the abandonment of Fort Mansfield, R. I., and the installation of four 5-inch guns at North Hill on Fisher's Island, about a mile from Fort H. G. Wright. These guns are for the purpose of covering Fisher's Island Sound, which has a sufficient depth of water to permit a torpedo boat destroyer or submarine to enter, and they are the only guns that now cover that area. There was an allotment of $60 for the construction of a pedestal for an azimuth instrument on either flank of Battery Hasbrouck, Fort Kamehameha, Hawaii. An item of $15,000 for the purchase of Great Brewster Island in the Boston Harbor. This island is necessary for the installation of stations in connection with the armament now emplaced and to be emplaced in the coast defenses of Boston. It was purchased from the city of Boston. Twenty-five thousand dollars to complete the installation of the 16-inch gun at Battery Newton, Fort Grant, Panama Canal.

This gun arrived there in October and was reported as completely mounted in November and is now ready for action. That allotment was due largely to the fact that the emplacement was constructed when the work was going on down at Panama, but the carriage had not been completely tested at Sandy Hook, so that when the carriage finally arrived there was a certain amount of work on the emplacement that had to be cut out to take the carriage, which had been altered from what the original plans contemplated. An allotment of $22,050 was made to provide accommodations for the personnel manning the two 12-inch guns at Fort Sumter, and in addition there was some work done at old Fort Moultrie on Sullivans Island. That work required some excavating, cutting down the walls of the old fort, both at Fort Sumter and also at Fort Moultrie, and the final construction of frame buildings which are covered with galvanized iron. On May 8 we had a request for an additional $3,000, inasmuch as the work could not be completed under the first allotment, so that the total allotment due to that work was $25,050. There was an allotment of $25,000 for the construction of platforms for eight antiaircraft guns at Panama. These mounts reached there early in October and the guns were expected in November. The platforms for the guns are emplaced at the three locks on the Atlantic side and one at Cristobal in the positions which were selected by the board of officers, of which the coast-defense commander was the president.

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These mortars, as you remember, were taken from the coast defenses of Delaware and a battery was installed for land-defense purposes, but it also covers a part of the sea area. The stations had all been constructed and the battery was ready for action, but no Signal Corps fire-control material had been appropriated for, so inasmuch as it was desired that this battery should be able to go into action this allotment was made to the Chief Signal Officer out of this contingent appropriation. An allotment of $31,645 was made to purchase a new cable to be laid between Fort Mills and Fort Drum, in the Philippine Islands. The old cable had broken down and the installation of new batteries at Fort Hughes, together with new fire-control stations at Fort Mills, necessitated additional cables. An allotment of $4,762.73 was made to provide the Signal Corps material for the installation at the new mortar battery, Fort Hughes, Philippine Islands, and to complete the installation at Fort Drum. Then to the Chief of Ordnance an allotment of $91,425 was made to defray the cost of replacing 129 azimuth instruments and 73 gunner's quardrants, which were withdrawn from the seacoast fortifications and sent with our first three regiments of Coast Artillery which were sent abroad last August. Then the two miscellaneous items total $10,244.34.

Ten thousand dollars of that was allotted to the disbursing officer of the Coast Artillery school at Fort Monroe. The Coast Artillery school was increased when the United States entered the war; the annual appropriation for the fiscal year is $28,000, but there was so much additional printing to be done to supply pamphlets to the greatly increased number of Coast Artillery officers, enlisted men, and the candidates for commissions who were there that an additional allotment was required. Then the $244.34 was to reimburse the Treasury Department for the installation of two beacons on Desdemona Shoal at the mouth of the Columbia River for use in connection with the mine field there. So we have allotted to the various supply departments just a little over one-half the appropriation. We have $471,389.33 left.

Mr. BORLAND. What was the purpose of that contingent fund? Was it to enable you to clean up odds and ends and to put yourselves in a defensive condition for the war?

Col. HASE. I think it was for that principal purpose and to have a fund available which would take care of numerous items, such as I have indicated here, things that were deemed absolutely necessary for the conduct of the war, and to cover items in which there was complete concurrence between the Office of the Chief of Coast Artillery and the Office of the Chief of Engineers.

Mr. BORLAND. You never had such a fund before?

Col. HASE. No, sir.

Mr. BORLAND. You had always reported your items to the committee and they had passed on them. Now you have a fund out of which you can practically do almost anything.

Col. HASE. It is true that we have always come to the committee for every cent of money that we have ever required, but it was foreseen that numerous questions would come up calling for small allotments of money, and some of them going as high as $60,000, and it was hoped that we would be able to have a fund out of which the disbursements might be made in order that we might have the coast defenses ready in case they should be called upon for action.

Mr. BORLAND. I notice that you gave as one of the items the installation of those 4.7-inch guns at Porto Rico, San Juan. You have never had defenses there?

Col. HASE. No, sir.

Mr. BORLAND. And you installed them out of this contingent fund?

Col. HASE. Yes, sir.

Mr. BORLAND. In Document 203 we have a letter from the Assistant Secretray of War, in which he says that the $1,000,000 contingent fund is not available for expenditure in Panama and Porto Rico.

Col. HASE. On that I would like to go into the history of just how that started. In the act of June 15, under the general heading "Fortifications and other works of defense," there is an item for the construction and protection of fire-control stations, etc., $3,147,225. The items which entered into that sum total covered not only the continental United States but Panama and the insular possessions. The Engineers questioned the right to use that money for the Philippines or Panama, because of the fact that it was under the general heading "Fortifications and other works of defense."

Later on in the bill there is a general heading "Fortifications in insular possessions," and later "Panama Canal fortifications." I went over and saw the Auditor for the War Department in person, and he advised me to write a letter to the Comptroller of the Treasury asking for information. That letter was sent and the comptroller returned it to us and told us we had no right to ask the question.

We then asked the Chief of Engineers to write such a letter, which he did, and the Conptroller of the Treasury said that inasmuch as the Congress had before it the estimate upon which this item was appropriated and in that estimate there were items for Panama and the insular possessions, therefore his opinion was that we could use the money for the purposes for which it had been appropriated. So the Chief of Engineers having questioned the same, he asked us in reference to the million-dollar contingent appropriation fund, and suggested to us that such verbiage as is suggested in the document you have there should be put in the bill in order that future correspondence might be eliminated, because questions will arise between the disbursing officer and the comptroller and the auditor.

Mr. BORLAND. You have actually expended a part of the money for the defensive work at San Juan, P. R.?

Col. HASE. Yes, sir.

Mr. BORLAND. Has that claim been audited and allowed?

Col. HASE. That has not yet been audited. The work has only been carried on since about two months ago.

Mr. BORLAND. What is the necessity for the continuance of this balance?

Col. HASE. The last request we received for an allotment from that appropriation was under date of May 8. I think it is absolutely necessary that we should retain that fund because of the numerous small questions that are coming up which can not be defrayed from other appropriations.

Mr. BORLAND. Well, suppose this committee passes upon some specific estimate and does not allow it, and then the officer in charge nevertheless thinks that it is imperative and asks you for an allowance from your contingent fund. There is nothing in the world to prevent you from making the allowance?

Col. HASE. No, sir; except the Chief of Coast Artillery usually watches those items that come in as requests from the contingent fund very carefully.

Mr. BORLAND. In other words, how is this question of contingency determined? Presumably you have taken a survey of your fortifications, and the war has been going on now for a year. You might have needed a contingent fund at the outbreak of the war, an unallotted fund out of which you could do anything that was necessary on the spur of the moment, but that was a year ago, and now you have had ample time to prepare your estimates and submit them to the committee, and will have ample time for future estimates. What is the necessity for such a fund continuing?

Gen. BARRETTE. Unexpected things continually are coming up. Mr. Borland, like the situation at Cape May and Cape Henlopen, which are altogether unforeseen.

Mr. BORLAND. You assume, then, that emergencies might arise that were absolutely unforeseen and would require the installation of new work or some changes or something of that kind?

Gen. BARRETTE. That would be the idea; yes, sir.

Mr. BORLAND. Do you use this fund, or have you used any part of it, for ordinary repairs or renewals or betterments of your fortifications?

Col. HASE. No, sir; these are temporary fortifications that are installed purely for the period of the existing emergency.

Mr. BORLAND. I notice you had an item there of $60,000 for Fort Hancock. You regarded that as an emergency, did you?

Gen. BARRETTE. Yes, sir. A storm came up and damaged the place and the engineers wanted to take action at once to repair the break.

Col. HASE. It was in the bill, if you remember. The first storm of September caused the damage, and the annual estimates were being made up at about that time, so it was included in the bill. In October another storm came up and did further damage, and the Chief of Engineers stated that unless the money was made available and the work of repairing started at once, another storm might come in and simply wash straight across the peninsula.

Mr. SLEMP. As I understand it, you simply ask for a continuation of this fund and do not ask for new money?

Gen. BARRETTE. That is correct, sir.

Col. HASE. We have tried our best to conserve it as much as we possibly could and not use it for any other purposes except those incident to the war and making the fortifications stronger and better

Mr. BORLAND. "Making the fortifications stronger and better" is a rather vague term. I think it ought to be a little more definite than that. It ought to be for purposes that can not be estimated for in the regular way.

Gen. BARRETTE For meeting unforeseen emergencies.

AIRSHIPS FOR SEACOAST DEFENSES, UNITED STATES.

(See p. 177.)

Mr. **Borland.** I notice you have stricken out the appropriation for airships for seacoast defenses. Does that mean they are dropped out of this bill entirely?

Gen. **Barrette.** No, sir; the policy decided by the Secretary of War was that the supply of this equipment to continental United States should be wholly subordinated and should not be permitted to interfere with the rapid accomplishment of the program for a supply of aeronautic equipment for operations in France.

PURCHASE OF SUBMARINE MINES AND NETS, ETC., FOR CLOSING CHANNELS TO OUR PRINCIPAL SEAPORTS.

Mr. **Borland.** You had an item "for purchase of submarine mines and nets and necessary appliances to operate them for closing the channels leading to our principal seaports, and for continuing torpedo experiments," which seems to have been dropped out.

Col. **Brigham.** There is no estimate in the bill this year for that, Mr. Chairman.

Mr. **Borland.** Have you any funds on hand from previous appropriations?

Col. **Brigham.** Yes, sir.

Mr. **Borland.** How much?

Col. **Brigham.** You will notice the deficiency act of June 15, 1917, carried an appropriation of $2,926,330, and the act of October 6 carried an appropriation of $700,000 under this item. Our total unobligated balance on date of December 31 was $1,673,260.23; but the torpedo depot at Fort Totten, N. Y., has since that date called for other allotments amounting to a total of something over $350,000, and I understand they have obligated themselves for about $200,000 for explosives, so that the free balance at the present time is approximately $1,000,000.

Mr. **Borland.** And you are not asking for any more money this year under this item?

Col. **Brigham.** No, sir.

Mr. **Borland.** You expect, however, to be able to use that $1,000,000 during the next fiscal year?

Col. **Brigham.** We hope so; yes, sir.

Mr. **Slemp.** You hope to get rid of it?

Col. **Brigham.** No, sir; that is not our idea. The specific purpose for which the first one of these appropriations was made was to provide all of the mine material for the Cape Henry project, to provide the mine material required to complete all of the submarine mine projects in the United States except one, and to procure some planting gear for some of the harbor boats which are used as auxiliary mine planters; and then an additional amount was provided in order to keep on hand a sufficient amount of reserve material to provide for the upkeep of these mine fields when they are planted, and I feel it is important that that money should be left available for that purpose.

Mr. **Borland.** Under what theory was the $700,000 added in October?

Col. BRIGHAM. That was for the purpose of providing larger material for submarine nets than originally was contemplated. When we first went into the business of planting submarine nets to deny the entrance of our harbors to submarines, we were working on a new proposition. There was nobody in this country who had complete information as to the size of the material that would be needed, and the best information we had led us to estimate on a certain size of twisted wire rope. After we had estimated for the material that we thought would be required to net our important harbors on the Atlantic seaboard, information received from abroad indicated that larger, heavier, and stronger material would be necessary. That is the reason that it was necessary to obtain $700,000 additional in the act of October 6, 1917.

Mr. BORLAND. You have not yet spent or obligated up to your original appropriation of $2,900,000 made on June 15, 1917? You have not yet overtaken that amount?

Col. BRIGHAM. No, sir; but we have practically used all of the $700,000 which was needed for nets. The reason we nave not used all of the other appropriation is because we have not been able to get deliveries of the material. We are getting this material just as fast as we can, and I have the program of the torpedo depot, which shows that it is expected to get all of it before the end of the next fiscal year.

Mr. BORLAND. Do your appropriations now cover your entire program for nets and submarine mine protection; in other words, when you have finally been able to expend all of this appropriation, will you then have covered all the field you have in mind to cover?

Col. BRIGHAM. There is one place that was not considered in this estimate.

Mr. GOOD. Will you be able to purchase the matériel and do the work in all the other places where submarine mines have to be placed?

Col. BRIGHAM. Yes, sir.

Mr. GOOD. Including Panama?

Col. BRIGHAM. Panama is carried in the sundry civil bill.

Mr. GOOD. But there was included in this appropriation of June 15——

Col. BRIGHAM (interposing). The item for nets was included.

Mr. GOOD. For nets only?

Col. BRIGHAM. Yes, sir. The estimate was $300,000 and $250,000 was appropriated for Panama.

PURCHASE, MANUFACTURE, AND TEST OF SUBMARINE-MINE MATÉRIEL FOR SUBMARINE-MINE PRACTICE, UNITED STATES.

Mr. BORLAND. You have an item here "For purchase, manufacture, and test of submarine-mine matériel, and other accessories for submarine-mine practice, $26,000." That is the same amount you have had for several years?

Col. BRIGHAM. Yes, sir.

Mr. BORLAND. How is your balance on that?

Col. BRIGHAM. Our unobligated balance at the present time is $20,560.29.

Mr. BORLAND. Do you think you will need that much?

Col. BRIGHAM. Yes, sir; for this reason: During the last year mine practice was not held at a number of the defenses on account of the disturbed conditions and changes in personnel. But it is contemplated to have during the coming year the practice which was omitted last year.

Mr. BORLAND. You mean you will have an extra amount of practice?

Col. BRIGHAM. Yes; during this year.

Mr. BORLAND. Why is it recommended to drop out the words "including the machinery necessary for their manufacture at the arsenals"?

Col. BRIGHAM. I can not say why that is necessary.

Mr. BYRNS. Probably you have already purchased it?

Col. BRIGHAM. I really do not know why it was included in the preceding bill.

Mr. BORLAND. Do you devote any portion of that money to the purchase of machinery at the arsenals?

Col. BRIGHAM. No, sir. The words that should be omitted from this bill probably are the words "at the arsenals."

Mr. BORLAND. Is there anything peculiar about this practice material over your ordinary material?

Col. BRIGHAM. Not at all.

Mr. BORLAND. The practice material is a part of your ordinary supplies?

Col. BRIGHAM. Absolutely; yes, sir.

Mr. BORLAND. Why has this been carried, "including the machinery necessary for their manufacture at the arsenals?"

Col. BRIGHAM. I am unable to say.

Mr. GOOD. From what source do you get this material?

Col. BRIGHAM. We buy it from the manufacturers.

Mr. GOOD. Is none of it purchased at the arsenals?

Col. BRIGHAM. No, sir; none of our submarine mine material is purchased at the arsenals.

Mr. GOOD. You do not manufacture any part of the submarine mine?

Col. BRIGHAM. We do not at the arsenals; no, sir; that is, to the best of my knowledge. We get our explosive for the submarine mines through the Ordnance Department, and some of it may be manufactured in Government powder factories.

Mr. BORLAND. That is the same kind of powder that you use for other purposes, is it not?

Col. BRIGHAM. It is the same kind of powder that is used as an explosive in some of our small shells.

Mr. BORLAND. My understanding is that you use for practice purposes the oldest ammunition and material that you happen to have on hand?

Col. BRIGHAM. Yes, sir.

Mr. BORLAND. That is the general rule?

Col. BRIGHAM. Yes, sir.

Mr. BORLAND. And that is probably what you do here, you use your ordinary supply of mine material?

Col. BRIGHAM. Always; yes, sir.

Mr. BORLAND. And use the oldest of it for practice?

Col. BRIGHAM. Yes, sir. In fact, we are using now, and have been using for some years, some mine material that is obsolete and which we would not put down in our regular fields.

Mr. SLEMP. How much have you used during this fiscal year for mine practice?

Col. BRIGHAM. That I could not say, because I do not know whether the disbursing officer carried a balance at the beginning of this year from the year preceding.

Mr. GOOD. What does the target practice with submarine mines consist of?

Col. BRIGHAM. We plant a group of mines, just as we would under service conditions; the positions of the mines are plotted and charted on our plotting board. A small target is towed across the mine field at random, and the proper mine is exploded at the proper time to blow up the target. This is all done just as it would be done if the target were a vessel of the enemy.

Mr. BORLAND. Do you actually undertake to hit the target?

Col. BRIGHAM. Oh, yes, sir.

Mr. BORLAND. You tow the target into a safety zone first.

Col. BRIGHAM. We start the target several thousand yards in advance of the line of mines and the safety officer does not allow the apparatus in the casemate to be started until he knows that the towing vessel is safe.

Mr. BORLAND. That the towing vessel is safe?

Col. BRIGHAM. Yes, sir.

Mr. BORLAND. But the target which is being towed is still in danger from the mine?

Col. BRIGHAM. Yes, sir; it is 500 yards in the rear of the towing vessel.

Mr. GOOD. The target practice, then, consists of a practice to ascertain the correctness or accuracy of the plotting?

Col. BRIGHAM. Yes, sir; and to test the apparatus in the casemate and the work of the entire personnel.

Mr. GOOD. In this same practice you also test the submarine mine that is furnished by the manufacturers, do you?

Col. BRIGHAM. Do you mean after it is planted?

Mr. GOOD. Well, I mean in exploding it. Is that the test you give to the manufacturers' product?

Col. BRIGHAM. Yes, sir; that is a test in a way, although we test our fields all the time; there are certain daily tests prescribed to show whether or not all of the mines in the field are effective.

MAINTENANCE OF SUBMARINE-MINE MATERIAL—UNITED STATES.

Mr. BORLAND. The next item is for maintenance of submarine-mine material within the limits of continental United States, etc. You had $68,000 in the current bill and $500,000 in the deficiency bill, making $568,000. What is the condition of your balance under that?

Col. BRIGHAM. The balances under that on December 19 were $452,834. Since that time calls have been made for about $45,440 more, leaving an unallotted balance of about $407,394.

Mr. BORLAND. What do you propose doing with that $407,000?

Col. **Brigham**. The larger portion of it will be required for the maintenance of submarine nets. That was the purpose of the appropriation carried in the deficiency act. We have installed the nets at a number of harbors and have found that the maintenance item will be a very much larger one than we had anticipated, and if all the nets shall be required to be put down this amount will be insufficient to maintain them.

Mr. **Borland**. Does this item include the ammunition of the mine itself, or does it include only the nets, cables, and material of that kind?

Col. **Brigham**. The item that we are asking for, $100,000, and the item carried in the 1918 bill of $68,000, includes the mine material as well as the expenses of the torpedo depot located at Fort Totten; the item of $500,000, carried in the deficiency act, was for the maintenance of submarine nets.

Mr. **Slemp**. Let me understand that. You have your nets purchased and installed?

Col. **Brigham**. Yes, sir; some of them.

Mr. **Slemp**. What is the cost of keeping them?

Col. **Brigham**. I was at Fort Monroe when the first net was installed, and after we got it in, after a great deal of trouble and the loss of some material, the first thing that caught in the net was an Old Dominion steamer outbound for New York, and that tore up a great portion of our net, which had to be replaced.

Mr. **Slemp**. There is not anything on the nets to rust, corrode, or wear out in a year's time, is there?

Col. **Brigham**. Yes, sir; they break. The strain of the wave action on them may cause them to break down in places. After they have been planted for a considerable length of time there is every possibility of their breaking down. You probably saw accounts of mines being washed up on the shore of Holland, and that was because of the twisting action of the waves on those mines, and in the same way there is a considerable strain on these nets. Then another thing happened to the net at Fort Monroe. The harbor was frozen over in the early part of this year, and when the ice went out the net went too. Things like that, which we do not anticipate, take place, and add to the normal cost of maintenance of these nets.

Mr. **Slemp**. But to have a submarine net you would want it below the ice, would you not?

Col. **Brigham**. These nets are suspended from buoys on the surface and extend from a few feet below the surface down to within a few feet from the bottom.

Mr. **Borland**. The $68,000 allowed in the regular bill was for the purposes mentioned in this item, and the $500,000 granted in the deficiency bill was specifically devoted to submarine nets?

Col. **Brigham**. That is correct, although the wording of the act would enable us to use the $500,000 for other classes of submarine-mine matériel if necessary.

Mr. **Borland**. You have them separated, however, in your balances?

Col. **Brigham**. Yes, sir.

Mr. **Borland**. But this balance is the combined balance?

Col. **Brigham**. Yes, sir.

Mr. BORLAND. I want to find out from you to which this balance is mainly devoted—is it devoted largely to the net balance that you have on hand, the balance for submarine nets?

Col. BRIGHAM. I can give you the separate balances under those two appropriations. The unobligated balance under the appropriation of $500,000, carried in the deficiency act, was $392,011.72, and the unobligated balance under the appropriation of $68,000 was $60,822.38.

Mr. BORLAND. So that you have $60,000 of your mine money on hand?

Col. BRIGHAM. That was in December, sir.

Mr. BORLAND. What is the condition now?

Col. BRIGHAM. Well, I would have to——

Mr. BORLAND (interposing). You have only had calls on that appropriation to the extent of $45,000?

Col. BRIGHAM. Yes. Just how much of that would be chargeable to mine maintenance and how much is chargeable to net maintenance I can not tell you at the present time, but I can get that for you.

Mr. BORLAND. What I am getting at is this: You have practically the greater part of your mine money of the current year still on hand. Have you secured all the mines that are needed for your program?

Col. BRIGHAM. No, sir. The reason for not having expended more of that is because the disbursing officer has been unable to get deliveries of this class of material as fast as he desires.

Mr. BORLAND. What particular thing can he not have delivered?

Col. BRIGHAM. Cable, for example, and that is very expensive. The manufacturers who supply this cable are busy supplying material for war purposes.

Mr. BORLAND. How about the mine cases?

Col. BRIGHAM. I can not tell you whether or not he has been able to keep up with his program under each separate item, but I can give you the classes of material that he is purchasing and the classes of material for which he has obligated money, but I can not tell you under which classes his deliveries are behind his program.

Mr. BORLAND. You could not tell from those figures in which particular thing he is short?

Col. BRIGHAM. No, sir; but I rather imagine it is principally in cable, and probably explosives also, because, of course, all of the output of explosives is being devoted to shipment abroad.

Mr. BORLAND. This explosive is the same class of explosive that is used in the detonating shells?

Col. BRIGHAM. In some of our shells; yes, sir.

Mr. BORLAND. Is that fired with a fuse or an electric spark?

Col. BRIGHAM. In our submarine mines?

Mr. BORLAND. Yes.

Col. BRIGHAM. In our mines we have what we call a compound plug containing a primer charge. This charge is fired by an electric use.

Mr. BORLAND. You are asking $100,000 more for mine material. What reasonable expectation have you that you can accelerate deliveries, and get more material next year than you are getting now?

Col. BRIGHAM. We hope to be able to complete our projects dur- the coming year.

Mr. **Borland**. What have you to say about your need for $100,000 in addition to the money you have on hand?

Col. **Brigham**. I should say that it is rather important to have it, for should we be called upon to put down a number of mine projects, the expense of maintaining them is going to be considerable.

Mr. **Byrns**. What policy do you follow with reference to your reserve? I mean as to amount—have you any fixed policy or do you just accumulate all that you can secure?

Col. **Brigham**. No, sir; we have arrived at a fixed figure, which is more or less of an arbitrary one; that is, 25 per cent for each project. Personally, from a number of years' work with submarine mines, I think that is a low figure.

Mr. **Borland**. You have another item in this bill, have you not?

Col. **Brigham**. Yes, sir; we have an item on page 86, which is for the maintenance of submarine-mine matériel in the insular possessions.

Mr. **Borland**. This is a similar item except it is applied to the insular possessions?

Col. **Brigham**. Yes, sir.

Mr. **Borland**. It is not so extensive in its wording, is it?

Col. **Brigham**. No, sir.

Mr. **Borland**. Do you send this material out from the torpedo depot at Fort Totten, N. Y.; is that your general depot?

Col. **Brigham**. Yes, sir.

Mr. **Borland**. For both continental United States and the insular possessions?

Col. **Brigham**. Yes, sir.

Mr. **Borland**. And that is the only depot you maintain in connection with these mines, and the work done there applies to the insular possessions as well as to continental United States?

Col. **Brigham**. Yes, sir. I would like to bring out the fact, Mr. Chairman, that of the $100,000 asked for under maintenance of submarine-mine matériel in continental United States a certain amount is for the administration of the torpedo depot; $9,000, to be exact.

Mr. **Borland**. That, of course, is a fixed amount; the same as last year.

Col. **Brigham**. It is $1,000 greater than last year on account of the increased expenses of the depot.

Mr. **Borland**. Is there more activity and work there?

Col. **Brigham**. Yes, sir.

MAINTENANCE OF SUBMARINE-MINE MATÉRIEL IN THE INSULAR POSSESSIONS.

Mr. **Borland**. Now, you had $10,000 for submarine-mine matériel in the insular possessions in the regular bill and a deficiency of $50,000. You make the same distinction there, namely, that the $50,000 was for net purposes?

Col. **Brigham**. That was mainly the purpose of the appropriation, although it is available for maintenance of other classes of submarine-mine matériel as well.

Mr. BORLAND. What is the condition of your balances?

Col. BRIGHAM. The appropriation of 1918 of $10,000 is practically all gone. The last report we had from the torpedo depot showed a balance of approximately $5,900, but since that time an allotment of $5,000 has been made to the depot, so that it is practically all gone. Of the $50,000 carried in the deficiency act, the unobligated balance is $50,000, for the reason that the nets have not been put down and therefore there has been no maintenance charge against them.

Mr. BORLAND. This item does not apply to the acquisition of the nets; it applies only to their maintenance?

Col. BRIGHAM. Yes, sir. There was $23,000 additional for the purchase of mines and nets.

Mr. BORLAND. Has that been expended?

Col. BRIGHAM. No, sir; the unobligated balance in that appropriation is also $23,000.

Mr. BORLAND. You have not bought any nets for the insular possessions and consequently have not installed any?

Col. BRIGHAM. That is correct.

Mr. BORLAND. What should we do about that money; do you want to retain it?

Col. BRIGHAM. I think it should be left available, because of the distance to our insular possessions; then whenever we shall be able to get deliveries on that class of matériel, I think it should be purchased and sent to these possessions to be kept on hand.

Mr. BYRNS. And the reason you have not purchased it is because you have not been able to get deliveries?

Col. BRIGHAM. Yes, sir.

Mr. BORLAND. And, of course, your orders have been subordinated to more pressing demands for that same class of material?

Col. BRIGHAM. Yes, sir. I would like to say with reference to the estimate for the coming year, that the amount shown is in error. The estimate for 1919 should have been $36,575 instead of $10,000.

Mr. BORLAND. Where has the mistake occurred?

Col. BRIGHAM. That I am unable to say. The Chief of Ordnance submits these estimates at our request. We send in the estinate to him and he submits it. That is due to the fact that it is ordnance property and is accounted for on ordnance property returns. I have here a copy of the inclosure which we forwarded, and the only explanation I can arrive at is a guess that they took the figures from the column which indicated the amount of last year's estimate instead of taking it from the column which was intended to show the estimate for this year.

Mr. BORLAND. Why did you increase the estimate?

Col. BRIGHAM. We increased the estimate first from $10,000 to $15,000 for maintenance of mine matériel, due principally to the increase in cost of matériel. We prepared a table showing the increases in the cost of all the different classes of mine matériel, and the average was an increase of about 50 per cent. Then the whole policy with reference to the purchase of submarine mine cable is involved in the further increase of $21,000. It has been the policy heretofore to purchase submarine mine cable in large lots, and consequently it has deteriorated in large lots. In other words, large amounts of this cable have gone bad at one time, and the torpedo depot, after a great deal of experimentation and consultation with the foremost cable experts and with the Bureau of Standards here in Washington, arrived at the policy of purchasing small amounts of this cable every year, and that is what this is based upon—purchasing every year about 5 per cent of the amount of cable necessary to maintain the projects. I have tabulated here the total amount of cable that is necessary for these projects and have taken 5 per cent of that, and, at the latest figures we have for the cable, it amounts to $21,575.

Mr. **Borland.** You have only had $10,000. That is the largest amount you have ever had in preceding years.

Col. **Brigham.** Yes, sir.

Mr. **Borland.** And if you bought large amounts of cable out of that, and you are now going to buy small amounts for $21,000, I do not quite follow you.

Col. **Brigham.** The torpedo depot has bought its cable in large lots. The torpedo depot supplies the cable for the insular possessions and for continental United States. The policy now proposed is to purchase and supply cable to our defenses in small annual increments.

Mr. **Borland.** The depot bought the cable in large lots, or in any lots they saw fit, and then they charged a certain amount of that to the insular possessions as the insular possessions were furnished with it each year. Now, is not that going to be the policy?

Col. **Brigham.** No, sir; they are going to buy it in small lots and buy it oftener.

Mr. **Borland.** I do not understand how that should increase the amount of your estimate.

Col. **Brigham.** We had procured practically all the cable necessary for the project in the insular possessions, but a large amount of it has deteriorated and become defective, and it is necessary to begin replacing that cable right away.

Mr. **Borland.** Then the real fact is that that cable which has already been supplied to the insular possessions has become defective, and you are asking this increased appropriation to supply new cable for the defective cable which was supplied in former years?

Col. **Brigham.** To replace a portion of the cable that has become defective; yes, sir.

Mr. **Slemp.** At the rate of about 5 per cent a year?

Col. **Brigham.** Yes, sir.

Mr. **Borland.** But a good deal of it has become defective, and that was not on a 5 per cent basis.

Col. **Brigham.** We are not replacing all the cable that has become defective over there for the reason that it was not considered sound policy to supply it all in one lot for the reason stated.

Mr. **Borland.** Are you keeping in place any defective cable?

Col. **Brigham.** Some that is partially defective; that is, in some instances a few of the conductors are defective.

Mr. **Borland.** Let me ask you this question: Have you discovered the cause of that cable being defective and traced the cause?

Col. **Brigham.** We think so with reference to that particular lot. That was something that involved experiments that extended over a considerable period of time. It is my recollection that the conclusion reached was that it was due to tar. The jute which is laid around the conductors as a protective cover underneath the armor was saturated with tar. This was required by the specifications and, I believe, is commercial practice. However, the conclusion reached was that the tar ate through the insulation.

Mr. **Borland**. Was the matter submitted to the Bureau of Standards?

Col. **Brigham**. It was taken up with them.

Mr. **Borland**. Did they make a report on it?

Col. **Brigham**. Yes, sir.

Mr. **Borland**. What was their report?

Col. **Brigham**. I am unable to say what their report was.

Mr. **Borland**. Has the Bureau of Standards reported any specifications that will furnish good cable?

Col. **Brigham**. Whether or not the Bureau of Standards has furnished specifications I do not know; but I do know that recent specifications which have been put out by the torpedo depot have required a greater thickness of insulation over the conductor.

Mr. **Borland**. When were those specifications put out?

Col. **Brigham**. I think about one year ago, or possibly a year and six months ago.

Mr. **Borland**. Has any cable been purchased under those specifications?

Col. **Brigham**. Yes, sir; I think some has been, but how much I do not know.

Mr. **Borland**. You are not positive whether any has been purchased or not?

Col. **Brigham**. No, sir; I am not positive, but I feel reasonably sure that some has been purchased.

Mr. **Borland**. Can you find out?

Col. **Brigham**. Yes, sir; we can find out from the torpedo depot.

Mr. **Borland**. I wish you would, and also find out whether the cable that has been furnished under new specifications has been put in place anywhere.

Col. **Brigham**. On second thought I can answer your question. About a year and six months ago, while I was on duty at Fort Monroe, Va., some of this new cable was received at that post. None of it has been put in place.

Mr. **Borland**. Has this question affected the cable in continental United States as well as the insular possessions?

Col. **Brigham**. No, sir; because all of that lot was shipped to the insular possessions.

Mr. **Borland**. Have you had any trouble with the cable in continental United States?

Col. **Brigham**. I think not to the extent we had over there; that is, nothing we attributed to anything radically wrong with the cable. Of course, the absolute life of this cable is not known, because experiments have not been conducted over a sufficient length of time to determine what its life is. I do not think the manufacturers are willing to give any guarantee as to its life.

Mr. **Borland**. Your depot at Fort Totten, N. Y., buys the cable without specifying whether it is for the insular possessions or for continental United States?

Col. **Brigham**. Yes, sir.

Mr. **Borland**. It buys a certain quantity of cable and as orders ıe in it sends it out to the place where it is needed?

Col. BRIGHAM. Yes, sir.

Mr. BORLAND. Did it happen to send any particular lot to the insular possessions that was not used at all in the United States?

Col. BRIGHAM. It is my recollection that was so.

Mr. BORLAND. And that was the defective lot?

Col. BRIGHAM. Yes.

Mr. BORLAND. And it happened all to get to the insular possessions?

Col. BRIGHAM. Yes, sir.

Mr. BORLAND. The same inspecting officer inspects it all?

Col. BRIGHAM. Yes, sir.

Mr. BORLAND. And there is no difference in the specifications?

Col. BRIGHAM. No, sir.

CONSTRUCTION OF FIRE-CONTROL STATIONS, INSULAR POSSESSIONS.

Mr. BORLAND. You have an item here on page 87 for construction of fire-control stations and accessories. You have had under the current bill $31,537. What was done with that money?

Col. HASE. That was appropriated for procuring ordnance plotting room equipment, plotting boards, range boards, deflection boards, and the observing instruments for the four 12-inch long-range batteries, three at Oahu and one in the Philippine Islands, and also for providing the same material, that is, ordnance plotting room material, for the mortar battery at Caballo. It was all allotted to the Chief of Ordnance as soon as the money was assigned to the office of the Chief of Coast Artillery.

Mr. BORLAND. Was it all used?

Col. HASE. Yes, sir; and the instruments are just about being completed now or turned over. Some of them have already been sent.

Mr. BORLAND. What is the basis of your present estimate of $51,707?

Col. HASE. That is made up of the following engineer items· For providing auxiliary base lines to permit the armament in the coast defenses of Oahu to be used to cover the landward area and also to provide stations to cover the seaward area, in case those installations should be destroyed, $24,450. Then changing the range display boxes at batteries Wheeler and Cheney at Fort Mills on Corregidor Island, $700. Those are the mechanical data transmission devices which are installed at these 12-inch batteries there now on the right side of the loading platform, and they want them moved over to the other side at an estimated cost of $700. Then providing fire-control material which should be on hand as a reserve at Fort Mills on Corregidor Island to permit the repair of the installation during a protracted siege, $26,557.57.

Now this latter item is one that has been considered important for two or three years, because we realize that Corregidor is so far away that in case of any offensive operations against it the island would have to be self-sustaining, and there is considerable electrical installation there, so that if there was not a reserve stock on hand, if anything should happen to the installation, the whole equipment would fail. This is an estimate totaling $26,000, which would provide a reserve stock on hand there which would be set aside for war uses.

Mr. BORLAND. A reserve stock of what?

Col. HASE. Of all sorts of fire-control apparatus, motor generators, telephones, cables, etc.

Mr. BORLAND. How much is involved in that item?

Col. HASE. $26,557.57. We sent that back to the local authorities twice for reconsideration, because originally it was very much more than that, and we told them to cut it down and pare it all along the line and to ask only for those things that were essential, and then it came back approved by the department commander.

Mr. BYRNS. Have you no such reserve now?

Col. HASE. No, sir.

Mr. BORLAND. You have $26,000 in this item for reserve parts for fire-control appliances on Corrégidor Island?

Col. HASE. Yes, sir..

Mr. BORLAND. What is the prospect of being able to obtain and supply that stuff in case the appropriation is made?

Col. HASE. I believe that the shief signal officer could go out in the market and buy that almost at any time, because it is commercial equipment and there is very little special apparatus. In other words, our electric companies, the Western Electric Co. and the General Electric Co., are able to turn out that equipment quite rapidly.

Mr. BORLAND. This $26,000 would represent a supply for approximately how long a time?

Col. HASE. I rather think that it is based on about a two years' supply.

Mr. GOOD. You have no fund that has been carried in former years which has been dropped and in which you have a balance, except the funds you have detailed?

Col. BRIGHAM. None that have not been covered; no, sir.

THURSDAY, MAY 16, 1918.

PURCHASE, MANUFACTURE, AND TEST OF SEACOAST CANNON, UNITED STATES.

STATEMENTS OF BRIG. GEN. J. H. RICE, NATIONAL ARMY, ORDNANCE, AND COL. E. M. SHINKLE.

Mr. BORLAND. General, the item we have under consideration now is:

> For purchase, manufacture, and test of seacoast cannon for coast defense, including their carriages, sights, implements, and equipments.

I notice that you had for this purpose in the regular bill of 1918, $9,231,000 and in the deficiency act $7,950,000, making a total of over $17,000,000. Will you give the committee information as to what has been done with those appropriations and what is the present state of your balances?

Gen. RICE. * * *

We have great difficulty in securing forgings, great difficulty in securing machinery, great difficulty in securing labor, and only the most urgent things for immediate use can be procured, and even those not always as rapidly as we would desire. Therefore, the coast artillery program has been cut down to a minimum, which the state of progress and the utilization that we could make of the plans employed justified. * * *

Mr. BORLAND. How are they getting along with their deliveries?

Gen. RICE. They are coming through at the rate expected; that is, under the latest estimates.

Mr. BORLAND. Are those guns made in our arsenals or are they made by private manufacturers?

Gen. RICE. The gun forgings are all made by private manufacturers, as the Ordnance Department in general does not make gun forgings, although we are now making a few at the Watertown Arsenal. Twenty-one of the carriages are being made by private manufacturers, the remainder being made at the Watertown Arsenal. The guns themselves are being machined, 21 by private manufacturers and the remainder at the Watervliet Arsenal.

* * * * * * *

Mr. BORLAND. How far has that work progressed?

Gen. RICE. We have the forgings on hand for four of the guns at the Watervliet Arsenal, and work is proceeding on one particularly with somewhat greater rapidity than the others, and the remainder are in various stages of progress. We expect that the first —— gun will be delivered about September and the remainder at intervals of about two months. We do not know yet whether we will get any further forgings for those guns during this war, because of the great capacity required, and there is a question as to whether that caliber of gun is available for any other use than emplacement in the seacoast fortifications. The carriages are under order at the Watertown Arsenal. Practically nothing is being done on any except the first, and that is being pushed forward only as other work in connection with the war permits; that is, it is going very slowly; it is about at the bottom of the list of priorities at the arsenal.

Mr. BORLAND. What class of carriages have you designed for those guns? Are you using a disappearing carriage?

Gen. RICE. Yes, sir.

Mr. BORLAND. Will they be a higher angle * * *

Gen. RICE. Yes, sir.

Mr. BORLAND. How much?

Gen. RICE. Thirty degrees; the old guns had 10 and 15. I may say in that connection that when the war started we were laying down a design for —— barbette carriage. A board, including two distinguished civilian engineers, was convened some time before the war for the purpose of looking into the practicability of the disappearing carriage for such heavy work and making recommendations on the subject. They found that the design was entirely practicable and recommended that a —— disappearing carriage be used or not used, depending upon the local conditions; in other words, they felt there were some places where it would be well to use a disappearing carriage and many places where it would be well to use a barbette carriage, and that is the theory on which we were proceeding. * * * The last instructions we had from the War Department were to make them disappearing. We have stopped work on the design of a barbette carriage for the reason that we did not expect to be able to use it during the war, but as soon as we get back to the seacoast work it will be completed, and I think probably the question as to whether we are going to use disappearing or barbette carriages will be up again. It gets up quite frequently. So that as the situation now stands, we are practically committed to one —— disappearing carriage by the amount of work that has been done, and that is about all.

Mr. Borland. And none of the barbette carriages?

Gen. Rice. No, sir.

Mr. Borland. Why is it that none of the foreign countries have adopted the disappearing carriage? We have had it in use in our country now for thirty-odd years, since 1888.

Gen. Rice. I have never been able to give a perfectly satisfactory answer to that question. The matter of types of armament is, to a degree, one of development. Of course, we know through our experience very much more about the design and manufacture of disappearing carriages than foreign countries do. They were much ahead of us in seacoast armament originally, and the original types were of the barbette class because of the protection they could get by great masses of cast iron which they used. I think it is, perhaps, natural that they should have developed along their own lines rather than take up a new line, which we were able to do when we started our program for armament in 1888.

Mr. Borland. In the Field Artillery, at the proving grounds, they sometimes seem to fire a gun to the point of destruction. That is to see whether the carriage will stand a certain number of continuous rounds and to see how a carriage will act after it has been pounded and pounded by a large number of discharges of a gun. That is not possible, of course, with seacoast cannon.

Gen. Rice. No, sir.

Mr. Borland. The expense is too great and the value of the gun is too great.

Gen. Rice. Very much.

Mr. Borland. And consequently we have never had a test of the carriages under the stress of a hot bombardment, have we?

Gen. Rice. No, sir.

Mr. Borland. There is no way in which we can arrive at that particular test.

Gen. Rice. I do not see any way; no. We know that in the seacoast fortifications the carriages have no limitation of weight as they do in the Field Artillery, except in a case, if it should arise, where the design is poor. A seacoast carriage should stand up through anything in the way of pounding because it is designed so much more heavily than are the field carriages.

Mr. GOOD. What is the result of your investigation in the construction of this disappearing carriage? * * *

Gen. RICE. We consider it, up to 30 degrees elevation, a practicable design.

Mr. GOOD. You have made one, have you?

Mr. RICE. We are making one now, but we have not completed it.

Mr. GOOD. No test, then, has been made?

Gen. RICE. No. * * *

Mr. BORLAND. With the guns mounted upon a carriage permitting 30 degrees elevation, how does the range of our seacoast armament compare with foreign fleets?

Gen. RICE. We should get with that elevation * * * a range, which I think is fully equal to the range obtained by any gun aboard ship. I have never heard of any guns aboard ship that had a greater elevation than 30° nor of any guns that were of greater length than 50 calibers.

Mr. BORLAND. The range of the gun is dependent upon the factors, first, of the elevation and then of the length of the gun as compared with its bore, that is what you call a 50-caliber gun.

Gen. RICE. That is what it amounts to in this way. Technically, the range is dependent upon the weight of the projectile, its initial velocity when it leaves the gun and the elevation at which it is fired. The initial velocity is normally a function of the length of the gun: that is, with the same pressure, in a longer gun you get a greater initial velocity, therefore we usually shorten it by saying a 50-caliber gun has a longer range than a 34-caliber, for instance.

Mr. BORLAND. Will our 16-inch guns in the seacoast defenses equal the range of any of the best guns on the battleships?

Gen. RICE. Yes, sir.

Mr. BORLAND. Prior to the time that the change was made from a 15° elevation to a 30° elevation, that was not the case, was it?

Gen. RICE. It depends upon what period you take. The development of long-range firing in the navies of the world is of comparatively recent date. At the time when the guns which we have in the seacoast fortifications were designed, that would not have been true. They had as long range as the Navy. The Navy's progress was more rapid than the Army's, and there was a period not long ago, and it exists to-day, when the latest battleship outranged our seacoast guns of a later type. * * *

Mr. BORLAND. We understand also that the sea-coast fortification has a decided advantage over a fleet in the question of accuracy of fire.

Gen. RICE. A very great advantage; yes, sir.

Mr. BORLAND. A sea-coast fortification has the space in front of it plotted and knows exactly when its target gets within a certain area, and, of course, the fleet is working more or less on an experimental basis.

Gen. RICE. Yes, sir.

Mr. BORLAND. In other words, the fleet has to come closer in order to obtain accuracy of fire?

Gen. RICE. Yes, sir.

Mr. BORLAND. And that is a handicap to the fleet which the fortification does not have?

Gen. RICE. I think so far as attack on objects on land by fleets is concerned, the greatest danger from the long-range guns of naval vessels is against larger targets than the fortifications, and one of the principal functions of the long-range guns in the sea-coast fortifications is to hold the fleet off so far that it can not shoot at cities or other targets which are more easily hit than the fortifications.

Mr. BORLAND. General, how much of your total appropriations already made is still on hand unallotted?

Gen. RICE. We had on May 10, 1918, an unallotted balance under the regular fortification act of $1,218,904.19.

Mr. BORLAND. How about the deficiency appropriation?

Gen. RICE. Under the act of June 15, 1917, we had that date $6,715,909.09, or a total of $7,934,813.28 cash. As to the contract authoritizations. the total authorizations of the two acts was $5,478,412, and there have been set up obligations against that of $1,327,412, so that the unobligated contract authorizations is $4,151,000. We therefore have a total cash balance and an unobligated authorization to incur obligations of $12,085,813.28.

Mr. BORLAND. What prospect have you of being able to employ any part of those funds?

Gen. RICE. In considering the question of the amount of money that is needed, we should deduct from the cash on hand, to put it on a single basis, the amount of the obligated authorization which would have the effect of transferring the obligation to the cash balance from the authorization. If you do that, and further deduct the amount which I estimate will be needed to meet the probable obligations for the completion of the work under order, $2,864,000, you would have left $3,744,000, which we consider as unlikely to be needed before the enactment of additional legislation.

Mr. BORLAND. If you transfer your contract obligations so far as you have incurred them to your cash balance, and reduce the cash balance by that amount, and then set aside a sufficient amount of your cash balance for the probable obligations that you will have to meet to complete the work in hand, you will still have $3,744,000 of cash on hand?

Gen. RICE. Yes, sir.

Mr. BORLAND. And your whole contract obligation power is still intact; that is, you have transferred all your obligations to cash?

Gen. RICE. Yes, sir.

Mr. BORLAND. Now what do you say about that $3,700,000?

Gen. RICE. That will probably not be used in the immediate future, because we are not contemplating placing any additional seacoast orders unless there should be some change in the war situation. The money which is needed to complete the outstanding orders will probably be pretty largely used within the next 6 months.

Mr. BORLAND. Then what do you say about the new estimate of $12,200,000; has that been withdrawn?

Gen. RICE. We are withdrawing that now.

Mr. GOOD. Do you mean to say, General, that the —— guns and carriages, and the —— barbette carriages and the —— antiaircraft guns and carriages will all be completed and delivered within six months?

Gen. RICE. No; I do not think they will all be completed and delivered within six months, but a very considerable part of the work will be done and we can not afford to go too close on the appropriation.

Mr. GOOD. No; I agree with you. All of them will be completed and delivered, you think, within the next fiscal year?

Gen. RICE. No; I do not think all the —— will be.

Mr. GOOD. General, did you state the cost to complete the —— guns and carriages, the —— barbette carriages, and the antiaircraft guns?

Gen. RICE. Yes, sir; $2,864,000.

Mr. GOOD. That would leave, then, about $5,500,000 of available cash after you had paid for all of the outstanding orders?

Gen. RICE. It would if we retained the contract authorization, but I think that under these circumstances, if there was any shifting of the money, it would be wise to retain the cash to cover them and let the contract authorization go.

Mr. GOOD. In regard to that, if you retained the contract authorization that would permit you to give contracts for any additions that you might feel it was necessary to make during the next fiscal year and not have the cash tied up. If we could shift the cash to some other appropriation, where you are actually going to use the money, it would make the situation a little bit more mobile, would it not?

Gen. Rice. Yes, sir, it would do that.

Mr. GOOD. It is likely you will not use the money during the next fiscal year?

Gen. RICE. We may not use all of it.

Mr. GOOD. If you had the contract authorization do you think you would use any other amount outside of paying for the things which you have ordered?

Gen. RICE. We are not figuring on anything except what we have orders out for.

Mr. GOOD. And after those are paid for you would then have over $5,000,000 of available cash?

Gen. RICE. No, sir. Perhaps I have not made myself clear. Taking into consideration only the part of the program which has been ordered or for which orders have been given this $2,864,000 would be necessary for that purpose, in addition to the amount which has been obligated under the contract authorization and under the cash.

Mr. GOOD. You then have orders outstanding under your contract authorization in addition to the six —— guns, the —— barbette carriages and the —— antiaircraft guns?

Gen. RICE. No; it is purely a book transaction. In placing the orders originally we obligated a part of the amount necessary to pay for them under cash and a part under the contract authorization, although we had cash unobligated on hand; in other words, if, as a book transaction, we had charged the obligation which I have spoken of here as being a contract authorization against the cash and deducted it from our balance, we would then have had all the contract authorization unobligated; that is, there would not have been anything charged against it at all, but both of those things, the cash and the contract authorization which have been obligated, are for these items which you have mentioned.

Mr. GOOD. You had total contract authorizations of $5,478,000?

Gen. RICE. Yes, sir.

Mr. GOOD. No appropriation has been made for them except as you have detailed, $9,231,000 in the 1918 act and $7,950,000 in the deficiency act. Assuming that those things that have been secured under the contract authorization are paid for out of the appropriations already made, how much will you have left of this $7,934,813?

Gen. RICE. $3,744,000.

Mr. GOOD. That will be a free balance?

Gen. RICE. Yes, sir.

Mr. GOOD. Against which there are at present no contracts or outstanding orders?

Gen. RICE. Yes, sir. That amount, $3,744,000, will not be required until there would be time to make another appropriation.

Mr. GOOD. And if your contract authorization remained in effect you would not be hampered if that amount, or most of it, was shifted to some other more needy project?

Gen. RICE. No, sir.

Mr. BORLAND. I find that the words "and the machinery necessary for their manufacture at the arsenals" have been omitted from this item. What is the occasion for the omission of those words?

Gen. RICE. Has all of that been omitted?

Mr. BORLAND. Yes, the words "and the machinery necessary for the manufacture at the arsenals."

Gen. RICE. What should have been omitted is "at the arsenals." It was not intended to cut out the authority to get the machinery necessary for their manufacture. We had some difficulty in the beginning in getting some legal determination as to whether we could use appropriations containing this wording for securing the machinery which was going to be put into plants owned by the Government but not at the arsenals, and for that reason we have tried to cut out the words "at the arsenals." But the wording "and the machinery necessary for their manufacture" ought to be left in the item.

Mr. BORLAND. It is manifest that in case the committee decided not to give any appropriation this year under that item, and the estimates are withdrawn, that the whole language of this item will have to be recast, if the item remains in at all, and the natural result would be that the item would drop temporarily out of the bill. If you want that authority you must recast that recommendation and do it right now.

Gen. RICE. That is so, and unless you want to make some shift of the money on hand, so far as the new appropriation is concerned, it would just disappear.

Mr. BORLAND. Even in that case you would have to redraft that item and that ought to be done, it seems to me, in your estimates.

Mr. **Good**. Even though that were redrafted and provided for contract authorizations you would want authority to purchase machinery for installation at places other than at the arsenals?

Gen. **Rice**. Yes, sir. If this language appears at all in the bill it should include the words "and the machinery necessary for their manufacture."

Mr. **Borland**. That is what you want? You want authority to purchase out of this appropriation the machinery necessary for the manufacture of this armament?

Gen. **Rice**. Yes, sir.

Mr. **Borland**. But you do not want to be limited to the use of it at the arsenals?

Gen. **Rice**. No, sir. Then, all that would need to be added to that would be the matter of the wording in regard to any action you may care to take on the question of funds which are on hand but which are not absolutely required.

Mr. **Borland**. As to the use of this machinery at places other than the arsenals, I suppose that is a matter that more properly comes under the procurement division?

Gen. **Rice**. Yes.

Mr. **Borland**. What is your particular division—engineering?

Gen. **Rice**. Yes; but I am appearing at this hearing because of my past acquaintance with the whole subject, rather than as the representative of the Engineering Bureau. I think I can answer most of the things you want to know.

Mr. **Borland**. Before the committee finishes the hearings, it is going into the question of the procurement of contracts with private contractors, the terms of those contracts, and so on.

Gen. **Rice**. That should be done with the Procurement Division.

Mr. **Borland**. That does not come under your particular division?

Gen. **Rice**. No, sir.

Mr. **Borland**. So we will leave that until we get the Procurement Division here.

Gen. **Rice**. I presume you want to take that up in connection with the Field Artillery, anyway?

Mr. **Borland**. I notice that the same question comes up in the next item, where you have cut out the language "and the machinery necessary for its manufacture at the arsenals."

Gen. **Rice**. That should not be done.

Mr. **Borland**. You want to cut out only the words "at the arsenals"?

Gen. **Rice**. Yes, sir.

PURCHASE, MANUFACTURE, AND TEST OF AMMUNITION FOR SEACOAST CANNON, UNITED STATES.

Mr. **Borland**. The next item is "For purchase, manufacture, and test of ammunition for seacoast cannon, and for modernizing projectiles on hand," etc. Colonel, I wish you would inform the committee what is the state of the balances under the appropriation of $10,940,000 that you had in the fortifications bill of 1918 and the $12,255,000 that you had in the deficiency bill and the appropriations prior to that time.

Col. SHINKLE. As of May 10 the Treasury balance of the general appropriation was $1,473,105.31.

Mr. BORLAND. When you speak of the Treasury balance do you mean cash on hand?

Col. SHINKLE. Yes, sir.

Mr. BORLAND. That is the obligated and unobligated money?

Col. SHINKLE. Yes, sir.

Mr. BORLAND. The Treasury balance means all of the cash you have on hand unexpended?

Col. SHINKLE. That is true.

Mr. BORLAND. Some of which is obligated and some of which is unobligated?

Col. SHINKLE. Yes, sir.

Mr. BORLAND. The only way the committee can get at it is by first taking the allotted amount and then the unallotted amount, and, of course, the allotted amount includes what has been allotted and spent as well as allotted and not spent. Sometimes we divide the item into the expended amount, the allotted amount which is unexpended, and the unallotted amount. That gives the committee a very clear idea.

Col. SHINKLE. Under the act of June 15, 1917, $3,020,810, a total of those two items of $4,493,915.31.

Mr. BORLAND. That is the unobligated balance of those two items?

Col. SHINKLE. No. There are due on contracts, orders, etc., from the general appropriation $1,455,907.79, and there is due on contracts, orders, etc., under the act of June 15, 1917, $2,710,086.52, a total due on contracts under the two acts of $4,165,994.31. The unallotted balance under the general appropriation is $17,197.52; the unallotted balance under the act of June 15, 1917, is $310,723.48, the total unallotted balance under the two acts being $327,921.

Mr. BORLAND. Did you have any unallotted balance from any previous appropriations?

Col. SHINKLE. Apparently not.

Gen. RICE. They are all included in the balances he gave there.

Col. SHINKLE. They are carried forward to the new cash appropriations.

Mr. BORLAND. Let us see if we understand that clearly. Out of these two appropriations the only amount which is unallotted and unobligated is a total of $327,921?

Col. SHINKLE. That is correct. Taking up the contract authorizations, there is $6,000,000 under the act of June 15, 1917, and $2,000,000 under the act of February 14, 1917, a total of $8,000,000. Of that a total of $6,211,637.80 has been allotted, leaving an unallotted balance of $1,788,362.20. The cash and allotted balance given above, $327,921, added to the unallotted contract authorization of $1,788,362.20, leaves a total balance of $2,116,283.20. The contract authorization of $2,000,000 contained in the act of February 14, 1917, has never been covered by a cash appropriation, and it is not the intention now to ask that that money be appropriated.

There has been on our books an allotment of $211,000 more under the contract authorization than the $6,000,000 covers; it is proposed to transfer this $211,000 to the $327,921 cash balance we have and not ask for the funds to cover that $2,000,000 contract authorization. If that be done we will then ask for a total of $6,885,000. Of this amount, $6,000,000 is to cover the contract authorization of the act of June 15, 1917; the remaining $885,000 is desired for the purpose of replacing detonating fuzes now in service in armor-piercing projectiles. Of course, we must ask for that under three different appropriations in order to make it applicable to ammunition within the limits of continental United States, in Panama Canal, and the insular possessions. I have prepared a short statement to show how that figures out financially. The estimate submitted to Congress under "Armament of fortifications, Panama Canal, H," and "Fortifications in insular possessions, H," which were for the purpose of providing the 10 per cent allowance for the war maintenance supply for one year, amounted to $838,000 and $1,574,000, respectively, a total of $2,412,000. The estimates we now desire to submit will provide for the use of the following sums under these different appropriations: "Armament of fortifications, Panama Canal, H," $120,000; "Fortifications in insular possessions, H," $225,000; and "Armament of fortifications, H," $885,000—a grand total of $1,230,000. This total is $1,182,000 less than the $2,412,000 estimated for under the appropriations of "Fortifications in insular possessions, H," and "Armament of fortifications, Panama Canal, H." Eight hundred and eighty-five thousand dollars of this should be under "Armament of fortifications, H," and should be deducted from these other figures. We are asking for this $885,000 cash for the purpose of replacing fuzes for projectiles in continental United States.

Mr. BORLAND. And this $6,000,000 for which you ask is to take up your contract authorizations?

Col. SHINKLE. Under the act of June 15, 1917.

Mr. BORLAND. I wish you would enlighten the committee on how it happens that you have spent this total of $29,000,000 for seacoast ammunition when there has not been any increase in the number of seacoast guns and when a large number of the seacoast guns have gone into the field service.

Col. SHINKLE. I may say that not all of this money has been spent. The Board of Review approved an authorized allowance of armor-piercing projectiles, and other components of ammunition, for the seacoast armament. The difference between that approved project and what was on hand was what remained to be purchased, and that has been tabulated. It is rather lengthy and complicated. But that quantity has been somewhat reduced, fortunately for the estimates. The estimates were based on prices that were current at the time the appropriation was asked for. We have reduced this somewhat because of the removal of armament from fortifications and the amount by which it has been reduced has just about balanced the increased prices that we have had to pay. So that had this not been done we would have been forced to ask for a considerable additional appropriation.

Mr. BORLAND. The Board of Review's project called for ammunition in the continental United States of $20,166,000; in the insular possessions of $7,384,000; and at the Panama Canal, $3,682,000, making a total of about $31,000,000. Did I understand you to say that you have practically provided for all of the Board of Review's project less the amount that was necessary for the guns that have been diverted to field service?

Col. SHINKLE. We have provided for it but have not provided it.

Mr. BORLAND. But you have obligated yourselves for it?

Col. SHINKLE. Yes, sir.

Mr. BORLAND. That is included in these obligated amounts?

Col. SHINKLE. It is.

Mr. BORLAND. What was it you said about the increased prices? What would have been the increased prices above the $31,000,000 if you had provided the full amount?

Col. SHINKLE. I am not sure I can answer that categorically. I have the figures here for each caliber and under the several appropriations, "Armament of fortifications H," "Armament of fortifications, Panama Canal, H," and "Fortifications, in insular possessions, H," separated, so that I can give that information. I can say, however, that the total under the three "H" appropriations was $49,507,000, divided as follows: "Armament of fortifications, "H," $32,195,000; Fortifications, in insular possessions, "H," $11,579,000; "Armament of fortifications, Panama Canal, "H," $5,733,000—a grand total of $49,507,000. That includes the total of the board of review's approved project.

Mr. BORLAND. That does not quite get at it yet. The board of review's project called for ammunition in continental United States of $20,166,000, and that is the item we are now considering. We are not considering the insular possessions nor the Panama Canal; we are considering continental United States, and their total estimate was $20,166,000. You had under this item a total of cash and contract authorization of $31,195,000. You are releasing $2,000,000 of that—I am not talking now of this fuse change, which is something new—leaving as having been spent or obligated $29,000,000. You have spent and obligated $9,000,000 more than the total of the board of review's project, and there is some deduction for the seacoast guns which have been sent into the field service; that is, I assume when they are in the field service the ammunition is not charged to this appropriation; is not that true?

Col. SHINKLE. That is quite true.

Mr. BORLAND. Now, what I want to get at is how much was the increase of price which would make your expenditures run to $29,000,000 on a $20,000,000 project, when the whole of the project was not covered. I also want to know if the whole of the project was covered, except for the guns in the field service; in other words, how far you are now toward the completion of the board of review's project. Can you give us that information?

Col. SHINKLE. I think so. I had probably better ask you to allow me to submit a memorandum of the details of that to you.

(The memorandum is as follows:)

The amounts of money referred to above by Mr. Borland, as required by the board of review's project of ammunition in the continental United States, insular possessions, and Panama Canal—namely, $20,166,000, $7,384,000, and $3,682,000, respectively, refer to "the approximate estimated cost of completing the increased allowances of ammunition proposed by the board for existing defenses." In addition to these amounts, totaling $31,232,000, amounts were estimated for by the board of review in its report to provide ammunition for the additional armament proposed by the board—$9,468,000 for the continental United States, $1,571,000 for the insular possessions, and $4,573,000 for the Panama Canal, or a total of $15,612,000. Therefore, the estimated cost for the ammunition for the two purposes of completing the allowances for the existing armament and of providing ammunition for the contemplated armament would be $46,844,000.

The ammunition on hand and under manufacture will provide the established allowances for both the guns of the armament existing in 1915 and of the armament contemplated in 1915, with the exception of the 12-inch mortars and the 16 inch guns. Sixty 12-inch mortars and twenty-two 16-inch guns were in the contemplated armament, and the ammunition required for them would cost, at present estimated unit costs, approximately $5,600,000; Therefore, the other types of ammunition should have been secured for approximately $41,250,000.

Since the report by the board of review (November, 1915), funds have been provided under the several appropriations dealing with seacoast ammunition amounting in all to $48,774,000. We have, therefore, had nearly $7,500,000 more than it was contemplated by the board of review would be necessary for the procurement of this ammunition. This excess is easily explained by the increased cost of this type of ammunition, amounting in some cases to 20 per cent. Indeed, the last appropriations as passed by Congress have made allowance for such an increase of cost.

Appropriations made since Nov. 26, 1915.

Armament of fortifications "H":	
July 6, 1916	$3,000,000
Feb. 14, 1917	10,940,000
June 15, 1917	18,255,000
Total	32,195,000
Fortifications in insular possessions "H":	
July 6, 1916	1,700,000
Feb. 14, 1917	2,229,000
June 15, 1917	7,650,000
Total	11,579,000
Armament of fortifications, Panama Canal "H":	
July 1, 1916	1,600,000
June 12, 1917	1,985,000
June 15, 1917	1,415,000
Total	5,000,000

Mr. BORLAND. Yes. What is the condition of your deliveries, Colonel, on this ammunition which you have ordered?

* * * * * * *

Col. SHINKLE. A relatively small percentage of the orders in numbers, but an appreciable percentage in value.

Mr. BORLAND. Are those American-made shells?

Col. SHINKLE. Yes, sir.

Mr. BORLAND. All of them?

Col. SHINKLE. Yes, sir; mostly Watertown Arsenal, Bethlehem, and Washington Steel & Ordnance.

Mr. BORLAND. What is the prospect as to your future deliveries?

Col. SHINKLE. They are coming along at a fair rate, but we have not asked for deliveries where it would interfere in any way with the delivery of shell for field service, and in some cases we have asked firms to take additional orders for field-service shells and put them ahead of armor-piercing projectiles, and it is not the intention to push this production at the expense of field-service shell.

Mr. BORLAND. Where the guns are ordered into field service is the same character of ammunition used?

Col. SHINKLE. No, sir; it is a different character of ammunition. The shell for seacoast work must be capable of piercing armor, which involves high grade steel, hardened, with a relatively thick wall and a low capacity for bursting charge. This shell is not suitable for field work, in the first place, and is too expensive in the second place. It does not carry enough bursting charge for effective work in the field and it is entirely different ammunition.

Mr. BORLAND. So that none of your shells ordered for seacoast work are being used in the field service?

Col. SHINKLE. No, sir.

Mr. BORLAND. The ammunition which is being supplied to the guns when they are in the field service is being supplied from the other appropriation?

Col. SHINKLE. Yes, sir.

Mr. BORLAND. Colonel, you say your are subordinating the manufacture of these armor-piercing shells for seacoast use to the orders and needs of the field service; you are allowing the factories to go ahead with the field-service supplies and giving them priority over your orders?

Col. SHINKLE. Yes, sir; we are, for the reason that there is quite a satisfactory supply of ammunition in the seacoast defenses.

Mr. BORLAND. How much ammunition have you on hand for your seacoast defenses?

Col. SHINKLE. Quite a satisfactory quantity.

Mr. BORLAND. Have you the reserve stock in percentages?

Col. SHINKLE. I have not.

Mr. BORLAND. What is the prospect of your getting deliveries and being required to pay out for them during the next fiscal year for all this obligated amount which you have here of $29,000,000? Are you going to need all of that money in order to clear up all your obligations? You are asking us to give you $6,000,000 in this bill to take care of your obligations under previous contract authorizations; are you going to need all of that $6,000,000?

Col. SHINKLE. It is expected we will, sir.

Mr. BORLAND. How reasonably is it expected? You are subordinating your orders and have a supply on hand now.

Col. SHINKLE. While we are subordinating the orders for seacoast shell, it is only where it interferes in a factory or in the raw material with the supply of field shell, and we feel that this project should be completed as soon as it reasonably can, without interfering with the progress or the preparations for supplying the field army.

Mr. BORLAND. Do you not anticipate that the demands of the American factories for field ammunition are more liable to increase than to diminish?

Col. SHINKLE. That is quite possible, but the resources for the manufacture of our ammunition are increasing at a very great rate at the present time, and we believe we will be able to spend that amount.

Mr. BORLAND. Within the next fiscal year?

Col. SHINKLE. Yes, sir.

Mr. BORLAND. It would be entirely practical, however, and satisfactory, I suppose, if the committee decided to continue some portion or all of your $6,000,000 authorization?

Col. SHINKLE. It would be satisfactory, perhaps, as to some portion, but scarcely all of it.

Mr. BORLAND. To what extent?

Col. SHINKLE. We must have the $885,000 cash.

Mr. BORLAND. We will leave that aside for the present. I am now talking about the $6,000,000 you had authorized in the last bill. How much of that are you going to need in cash during the next fiscal year, and how much could practicably be left in the form of contract authorization?

Col. SHINKLE. It depends entirely on deliveries under contracts now let, and it would be a serious embarrassment if the department was not able to pay its bills for articles delivered. I should think that $3,000,000 cash would probably carry us through until the next session of Congress.

CHANGING ALL DETONATING FUSES ON ARMOR-PIERCING PROJECTILES.

Mr. BORLAND. Colonel, you are asking for $885,000 for changing all of the detonating fuses on the armor-piercing projectiles. Just explain that to the committee as fully as you can.

Col. SHINKLE. The detonating fuses in our armor-piercing projectiles are of a general design adopted nearly 20 years ago and contain no bore safety feature. They also have given considerable trouble from deterioration of the primers, partly because of the composition of the primers and partly because of the conditions under which they must be stored, especially in the tropical climates and in many of the fortifications in the United States. * * *

We have been having tests of these fuses for some time, and about a year and a half ago there was an extensive test at the Indianhead Proving Grounds against armor plate which was far from satisfactory. Upon receipt of the results of these tests, the department took up on its own accord more extensive tests to ascertain the quality of the fuses in our service. We sent for representative samples of fuses from every armament district within the United States and sent them to Frankford Arsenal and to our proving grounds to have them tested. The conclusions we drew from those tests were that there would be an unduly high percentage of improper functionings. When you consider that the cost of a fuse in a projectile is less than $5, whereas the cost of the projectile and its propelling charge may run to several hundred dollars, and that if the fuse does not function properly the result of the round is largely wasted, it is at once apparent that it is no economy to allow poor fuses to remain for the sake of saving the small amount of money necessary to replace them.

When these fuses were designed, I think I am correct in saying that there was not a bore safety device in existence in the world. It has been recognized for some years past that a really modern fuse for use in a high explosive shell should contain a bore safety device for the reasons I have indicated above. I might add that bore safety devices are in general such that the detonator or the fulminate of mercury is carried in a safe position while a projectile is in the bore, and if for some unforeseen cause the fulminate of mercury explodes while the projectile is still in the bore, there is sufficient expansion room, surrounded by a solid chamber, to completely confine the gases and not allow them to get out into the high explosive of the shell. For those reasons it seems imperative that these fuses should now be replaced, since there is an entirely satisfactory fuse available and in use by another department of the Government.

Mr. BORLAND. Are your fuses manufactured separately from the shell?

Col. SHINKLE. Yes, sir.

Mr. BORLAND. And they are assembled after you get them into the fortifications?

Col. SHINKLE. The shell in the fortifications are kept with a certain percentage fused and a certain percentage loaded and not fused, with the fuses right by. It will be necessary for us to send out men to substitute the fuses in the fused shells and to substitute new fuses for the fuses kept in storage at the fortifications.

Mr. BORLAND. What does your estimate of $885,000 cover? Does it cover the changing of fuses in all the reserve ammunition on hand?

Col. SHINKLE. All the ammunition on hand in continental United States.

Mr. BORLAND. Does it provide for the ammunition which is under manufacture?

Col. SHINKLE. The same funds that were allotted for the fuses for those shells will now be used for a different type of fuse.

Mr. BORLAND. Do you feel you have a satisfactory fuse now?

Col. SHINKLE. We have a satisfactory fuse that is in use by the Navy Department and has given eminently satisfactory results.

Mr. BORLAND. And that is what you want to adopt for the fortifications?

Col. SHINKLE. That is the fuse that will be adopted.

Mr. BORLAND. Colonel, this entire program of yours contemplates providing a reserve stock of ammunition for guns that have been taken away from the fortifications and sent into the field service; in other words, you are going to provide ammunition here in continental United Stages for guns that may be back some time; is that it?

Col. SHINKLE. There has been a certain reduction because of the removal of guns.

Mr. BORLAND. Is that reduction proportionate to the number of guns that have been removed?

Col. SHINKLE. It is not quite proportionate to the number of guns that have been removed, but I want to call your attention to the fact that the guns and not the carriages nor the emplacements have been removed and the bigger part of the investment still remains in the fortifications.

Mr. BORLAND. But the bigger part of the chance to use ammunition does not remain.

Col. SHINKLE. It is to be assumed that either those guns will be replaced or replacement made by other guns of a similar character.

TARGET-PRACTICE AMMUNITION FOR SEACOAST ARTILLERY—UNITED STATES.

Mr. BORLAND. "For purchase, manufacture, and test of ammunition, subcaliber guns, and other accessories for sea-coast artillery practice."

You have stricken out the words "including the machinery necessary for their manufacture at the arsenals."

Gen. RICE. That should be included, all except "at the arsenals."

Mr. BORLAND. Under this item you had a total in the fortification and deficiency bills of $2,572,000 for practice ammunition. Do you keep your accounts on this practice ammunition separate?

Col. SHINKLE. Yes, sir.

Mr. BORLAND. Or do you lump it into the general ammunition account?

Col. SHINKLE. No, sir; it is kept separately, because it contains some items that are not contained in the regular ammunition, as, for example, subcaliber guns and accessories.

Mr. BORLAND. What is the condition of your balances under this item?

Col. SHINKLE. The balance as of May 10 under the general appropriation is $153,110.79, and under the act of June 15, 1917, it is $782,188.51, or a total of $935,299.30. There is due on contracts under the general appropriation $162,253.37, and there is due on contracts under the act of June 15, 1917, $547,233.62, making a total due on contracts of $699,486.99. The unallotted balance under the general appropriation is $857.42, and under the act of June 15, 1917, the unallotted balance is $234,954.89, making a total unallotted balance of $235,812.31.

Mr. BORLAND. Colonel, I had the idea that much of the ammunition that was used for practice purposes was the older ammunition that you had in reserve.

Col. SHINKLE. In very few cases have we ever used service ammunition for target practice. We make the shells for target practice of cast iron, and they are not loaded with high explosives, and they are not fused. We simply observe where it strikes by the splash, and it is not necessary to have a bursting charge and a high-grade steel hardened shell.

Mr. BORLAND. So that your practice ammunition is very largely a class by itself?

Col. SHINKLE. Is is.

Mr. BORLAND. And it is a cheaper form of ammunition?

Col. SHINKLE. It is a much cheaper form so far as the shell goes, and it has no fuse, but of course the powder charge is just as expensive, except we do use a slightly reduced charge to save the guns as much as anything else.

Mr. BORLAND. And you also use subcaliber?

Col. SHINKLE. We do use subcaliber, and that is very inexpensive, relatively speaking.

Mr. BORLAND. Colonel, the amount you asked for in the regular appropriation bill of 1918, $572,000, and which was the amount granted, was a little higher than you ever had before and presumably was up to your full requirements for practice ammunition as the guns then existed in the seacoast defenses. On what theory was the $2,000,000 asked for in the deficiency bill?

Col. **SHINKLE**. I should say that the increase was almost entirely due to the training of militia troops.

Mr. **BORLAND**. Coast Artillery troops?

Col. **SHINKLE**. Yes, sir.

Mr. **BORLAND**. What has been the condition of the deliveries on your orders?

Col. **SHINKLE**. It has been very satisfactory. It only interferes with war material to any extent in the case of powder, as the shells are mostly made by foundries with machine equipment.

Mr. **BORLAND**. You say there has been an increased number of Coast Artillery troops, largely National Guard troops I suppose?

Col. **SHINKLE**. That is true.

Mr. **BORLAND**. And that has occasioned a larger amount of target practice?

Col. **SHINKLE**. It has; yes, sir.

Mr. **BORLAND**. That is the basis of this very large deficiency estimate of $2,000,000?

Col. **SHINKLE**. It is, and it is also true that it requires more firing to train and to bring to a reasonable state of proficiency an untrained company than it does to maintain a company of trained Regulars during the year.

Mr. **BORLAND**. Is that condition expected to continue during the next fiscal year?

Col. **SHINKLE**. Yes; I think it is.

Col. **BRIGHAM**. I can answer that by saying we know it will, and that the personnel at the present time at the fortifications is just about treble the normal personnel of the Coast Artillery Corps.

Mr. **BORLAND**. You use those fortifications as a species of training camps for Coast Artillery men?

Col. **BRIGHAM**. Yes, sir; we are using all of our coast fortifications for that purpose and for the training of the men who are being organized into regiments for service abroad.

Mr. **BORLAND**. Is your target practice pretty continuous?

Col. **BRIGHAM**. Well, for any one fortification I would not like to say that the pracrice is continuous, but we endeavor to have at least one practice for every organization in each coast defense every year; that has always been our aim, and we now hope to increase that to possibly two practices for each organization in order to have them get an increased amount of training.

Mr. **BORLAND**. What is the effect of the target practice by reason of the removal of a large number of these smaller caliber guns? Does that reduce your opportunities for target practice?

Col. **SHINKLE**. There is still a sufficient number of guns for training the personnel.

Mr. **BORLAND**. As I understand the target practice at the fortifications it is intended to drill the crew in hitting a target that is within the area protedted by those fortifications?

Col. **SHINKLE**. That is true.

Mr. **BORLAND**. Does it have the effect of training the troops for any work in the field?

Col. **SHINKLE**. Quite so, as it gives them general knowledge of the material and how the guns are fired, etc.

Mr. BORLAND. So that you regard this target practice as being necessary even though the guns are transferred to the field and the troops are transferred?

Col. SHINKLE. It is quite necessary. It is simply a training school to get the troops in such shape that they can be transferred to the field. They would be perfectly useless in the field if they were not familiar with the guns, how they operated and how they are fired. and that training must be given somewhere, either in France or in this country.

Mr. BORLAND. What is your idea in regard to the use of that $235,812 unallotted balance?

Col. SHINKLE. I should say that is only a reasonable working balance of about 10 per cent. I might also add that it is possible we will want to change the design of some of the latter part of this material before it is delivered, as the development of the designs is very rapid at this time.

Mr. BORLAND. It is not likely, however, that you will use all of that during the present fiscal year, seven weeks remaining of the fiscal year.

Gen. RICE. It is difficult to be sure about that, because some of this work is being done at the arsenals where we have allotments and not fixed-price contracts, and they do not always get in their requests for additional funds immediately; so I think it would be rather dangerous not to have it on hand.

Mr. BORLAND. Give us an explanation of this new estimate, $1,700,000.

Col. SHINKLE. I have here a table of allowances per gun, which are substantially the same as shown in General Order No. 6, War Department, 1917, and which have been published as the target-practice allowances. I also have a table of the estimated cost per round. There are some other small items, such as targets, rope for towing targets, and other items that are not great in their aggregate. These two tables are the main basis for computing that.

Mr. BORLAND. How do the prices of this material this year compare with prices that you paid last year?

Col. SHINKLE. They are appreciably higher, but I am not able to give you a percentage.

Mr. BORLAND. How much of this work is done in our own arsenals?

Col. SHINKLE. Relatively little.

Mr. BORLAND. Most of it is done by private manufacturers?

Col. SHINKLE. It is.

Mr. BORLAND. Do you find that you have to subordinate your orders to private manufacturers to the orders for shells for the field service, or is there any conflict?

Col. SHINKLE. There is very little conflict for the reason that nearly all of the shells are made by cast-iron foundries that are not prepared to make steel shells for the field service. There is a conflict, however, in the case of powder; but this must be supplied, as it is the direct training of the personnel for field service.

Mr. BORLAND. Your estimate is not based upon the number of men in the service, but is based upon the number of guns in the service, I notice.

Col. SHINKLE. That is true.

Mr. **Borland.** All of our other estimates are based upon the number of men.

Col. **Bingham.** If I may add a statement there, the same result will be reached, approximately, by figuring on the basis of the number of personnel.

ALTERATIONS AND MAINTENANCE OF SEACOAST ARTILLERY, UNITED STATES.

Mr. **Borland.** "For alteration and maintenance of Seacoast Artillery, including the purchase and manufacture of machinery, tools, materials necessary for the work, and expenses of civilian mechanics and extra-duty pay of enlisted men engaged thereon." You had a total of $3,700,000 in the fortifications bill. What is the condition of your balances?

Gen. **Rice.** The Treasury balance under the general appropriation is $529,505.64 and under the act of June 15, $2,714,138.16, a total of $3,243,643.80. Due on contracts, orders, etc., under the general account, $521,011.64; due on contracts, orders, etc., on account of the act of June 15, $404,144.63; total $925,156.27. Unallotted balance, general account, $8,494; act of June 15, $2,309,993.53; total, $2,318,487.53.

The **Chairman.** What has been done under this item? What has been the nature of the alterations?

Gen. **Rice.** We have not done very much in the way of alterations, but we have provided the usual maintenance of the armament. I have a list of it here, but it is of a very extended character and I do not think you would care to have it. The operations have been very limited except for the ordinary maintenance of the armament in the seacoast fortifications.

Mr. **Borland.** There have been no alterations of any substantial nature?

Gen. **Rice.** Not very material. We were finishing up the alterations in the early part of the year on increasing the elevation of the 12-inch gun carriages, and we have done some work on increasing the elevation of the 14-inch, but those have not been pushed with any great degree of celerity, so there was not a great deal of money spent, and the other modifications have been practically abandoned.

Mr. **Borland.** The money that has been spent for maintenance has been more than 200 per cent greater than in any previous year. What is the occasion for this very large increased expenditure for maintenance?

Gen. **Rice.** It was mainly due to modifications of 12-inch and 14-inch carriages for higher elevation, to spare parts for seacoast carriages, to modify breech mechanisms, and to the relining of seacoast guns. Much of the money is obligated, but not spent.

Mr. **Borland.** My question was what was the occasion for the largely increased expenditures? Your answer refers more to the reason why the expenditures have not been greater. What is the reason for the largely increased estimate?

Gen. **Rice.** You mean the $3,000,000 estimate? The reason for the estimate was in order to get money with which to maintain the railway artillery, for which an appropriation was made in the corresponding item for carriages and guns, and then only a part of that money was spent for railway artillery, it having been considered to be field artillery and transferred to that appropriation, and consequently the amount of this maintenance money that was spent was small. The reason for asking in the deficiency bill for $3,000,000 instead of the comparatively small amount that had before been asked was because at that time it was expected to maintain the railway artillery with that money.

Mr. **Borland**. And now the railway artillery is being maintained out of the field artillery fund?

Gen. **Rice**. Yes, sir.

Mr. **Borland**. How much of the maintenance money was to be used for railway artillery, according to your original plan?

Gen. **Rice**. Approximately, $2,000,000.

Mr. **Borland**. I take it the expense of maintaining railway artillery is very much larger per gun than the expense of maintaining seacoast artillery.

Gen. **Rice**. That would be correct; yes, sir.

Mr. **Borland**. Now, of that amount you have an unallotted, unobligated balance of $2,318,000. Do you intend to use that money now?

Gen. **Rice**. No, sir.

Mr. **Borland**. How much, if any, do you intend to use?

Gen. **Rice**. We should retain $400,000 of it.

Mr. **Borland**. For what purpose do you want to retain the $400,000?

Gen. **Rice**. We should have it for repairs and maintenance and for possible increases in allotments of the various things that we have under manufacture which will amount to something, and for contingencies. Of course, this is an item in which contingencies are quite likely to occur, so that the total amount of $400,000 will be spent practically entirely for maintenance.

Mr. **Byrns**. You mean you withdraw the present estimate of $330,000?

Gen. **Rice**. Yes, sir; that need not be appropriated.

Mr. **Borland**. General, is there any difference in the maintenance of coast artillery by reason of the war; is the expense of maintenance larger?

Gen. **Rice**. Yes; it should be somewhat larger.

Mr. **Borland**. How much larger? In other words, we should get back either this year or next year to a normal basis of some kind in the maintenance item for seacoast artillery. This extraordinary situation with reference to the railway artillery has sort of confused all of the estimates. This item has been running at about three or four hundred thousand dollars.

Gen. **Rice**. The estimates were $500,000 in 1916, $618,000 in 1917, and $700,000 in 1918.

Mr. **Borland**. And if we cut out the railway artillery and get it back to some normal basis, I would like to have you state whether the cost of maintenance is greater during the war and whether we can expect it will be decreased upon the conclusion of peace.

Gen. **Rice**. The appropriation made under this heading, Mr. Chairman, has never during recent years been only maintenance. There has been a certain amount that has been allowed for the modernization of the older equipment and things of that kind, so that the total amounts shown here are not a direct indication of the amount that was spent for maintenance. I do not think it would be possible at this time to state what the difference was going to be as between the two, but there is no question that the war maintenance is going to be higher than peace maintenance.

Mr. GOOD. What do you charge to maintenance under this item as distinguished from alteration?

Gen. RICE. We count as maintenance anything that has to do with keeping the carriages and guns in serviceable condition and which does not constitute any change or improvement in their design. There are a certain number of breakages, and there is a certain amount of material that has to be furnished in the way of lubricants and paints and various things of that kind, and there are many items which occur solely in regard to keeping the equipment in good condition. We have armament machinists and foremen who do nothing else and they are paid out of this appropriation.

Mr. GOOD. Did I understand you to say that you would need $400,000 this next year just for maintenance alone, practically, under this item?

Gen. RICE. That is the amount I think should be retained. I think probably we will not need that much money, but I certainly would not be willing to be found short of that.

Mr. GOOD. For five years prior to 1917 you had only had under this item, which also included alterations, $300,000.

Gen. RICE. Yes, that is correct. The figures I gave a moment ago were the estimates. That $300,000 appropriated in those years covered more than maintenance. It allowed some little alteration—very little, indeed, considering the total planned—but under these conditions the maintenance is certainly going to be very much higher, but just how much I do not know.

Mr. GOOD. You are not counting on making any alterations to speak of during the next year?

Gen. RICE. No, sir.

Mr. GOOD. How about the purchase or manufacture of tools and machinery?

Gen. RICE. That language should be left in.

Mr. GOOD. Is it contemplated to manufacture or to purchase any tools?

Gen. RICE. That is not expected, but of course that would include shop tools that it might be necessary to obtain in the course of ordinary work. It is not our intention, however, to put in any machine tool equipment.

PROVING GROUNDS, ARMY.

(See p. 435.)

SANDY HOOK, N. J., ABERDEEN, MD., SAVANNA, ILL., LAKEWOOD, N. J.

Mr. BORLAND. In the item for the proving grounds, you have cut out the words "ground, Sandy Hook, New Jersey."

Gen. RICE. Yes, sir; that is due to the fact we have now a regular proving ground at Sandy Hook, N. J., one at Aberdeen, Md., and one at Savanna, near Rock Island, Ill.

Mr. BORLAND. The one at Savanna is not yet in operation, is it?

Gen. RICE. No, sir; but we expect to begin proving out there very shortly.

Mr. BORLAND. You had $90,000 in the bill for 1918. I assume that was to take care of the current expenses of the grounds?

Gen. RICE. Yes, sir.

Mr. BORLAND. How have you gotten along with that amount?

Gen. RICE. We have an unallotted balance left under the appropriation of $8,361.80.

Mr. BORLAND. What was the purpose of the deficiency appropriation of $600,000?

Gen. RICE. That was the increase necessary for the maintenance and operation of the proving ground due to the work which has devolved upon the department on account of the war. I may say that this $8,361.80 is the total balance under both of the proving ground appropriations. The unallotted balance under No. 15 is $2,833.88.

Mr. BORLAND. Was that simply the cost of operating these proving grounds as distinguished from any construction item?

Gen. RICE. It was the cost of the maintenance of rail transportation, repairs and alterations, service of employees, hire of assistants, purchases of instruments, building and repairing butts and targets, and clearing and grading ranges. There has not been any considerable, if any at all, construction work; certainly no construction work that comes under appropriations, has been done with that money. The expenses of the proving grounds of this character have been very considerable, because we have recently developed a very great increase in the amount of work of proving that is being done, and as a matter of fact, the amount of money we had under both of those bills was not sufficient for the work. Of course, the manufacturing appropriations involve also testing, and it is always a question as to the dividing line between these appropriations and the things that become directly chargeable to the manufacturing appropriation due to the testing of the material manufactured, and we have had to draw a bit heavily upon the manufacturing appropriations in our interpretation of the two laws, because this amount did not meet the needs.

Mr. BORLAND. General, you have an enlisted personnel in the Ordnance Department. How large is that personnel?

Gen. RICE. I do not know what the total is. We have at the proving ground, I think, something like 1,000 enlisted men at Aberdeen.

Mr. BORLAND. How large is your total corps?

Gen. RICE. The total authorized strength of enlisted men for the Regular and National Armies is 47,500, with a provision of 5 per cent of the total strength for replacement. The enlisted strength at this date for the Regular and National Armies is about 27,000 men.

Mr. BORLAND. To what extent do you use enlisted men of the Ordnance Corps for the work of the proving grounds?

Gen. RICE. They are used in the proof work, in the handling of the matériel, and also used in the care of the grounds to a certain extent. All the mechanical skilled labor is normally done by civilians. At present we are running schools and hoping to get some of that work done by enlisted men.

Mr. BORLAND. You have a large number of civilian employees on the proving ground. Is it expected you are going to supplant them with enlisted men, and if so, to what extent?

Gen. **Rice.** I do not know just how far we will be able to do that, but we are doing it to some degree, for the reason that in the mechanical work it is very difficult to obtain and then to retain such men unless they are enlisted.

Mr. **Borland.** You have quite a machine shop at Aberdeen and you are greatly enlarging it?

Gen. **Rice.** Yes, sir.

Mr. **Borland.** Do you expect to man that machine shop with civilian employees or enlisted men?

Gen. **Rice.** We will probably have some enlisted men and some civilian employees. Our tendency is to train the enlisted men to do that kind of work as much as we can.

Mr. **Borland.** It would be very much better, it seems to me, to have your enlisted personnel take care of your guns and repair them and refit them and remount them, etc.

Gen. **Rice.** It has certain manifest advantages, but ordinarily, in times of peace, it is not better, I should say.

Mr. **Borland.** For what other purpose would you have enlisted personnel in the Ordnance Corps, if not for the care of the guns in a mechanical way?

Gen. **Rice.** Heretofore, before the breaking out of the war, they had never been used for that purpose, but had been used solely for the manning details on the firing, for the cleaning of the guns, and for the care of the buildings and grounds and things of that kind.

Mr. **Borland.** Is not that done by the Coast Artillery? The manning of the guns is done by the Coast Artillery, is it not?

Gen. **Rice.** I am talking about the work at the proving grounds. Of course, the Artillery is not connected with that.

Mr. **Borland.** But the Coast Artillery actually shoots the guns?

Gen. **Rice.** Yes; but I was thinking of the guns in use in our proving tests and experimental work.

Mr. **Borland.** It occurred to me that if you had an enlisted personnel at all in the Ordnance Department, and you seem to have quite a substantial one, their chief duty would necessarily be to look after the care of the guns from a mechanical standpoint.

Gen. **Rice.** Of course ordinarily, in peace times, you can not get trained mechanics to take enlistment, and for that reason, among others, we have not endeavored to do it, and our force of really good mechanics has not been very large in peace times, but we are doing what we can along that line at present under these exceptional conditions.

Mr. **Borland.** General, you have an estimate this year of $850,000 under this heading. What is the basis of this estimate?

Gen. **Rice.** This estimate was submitted last fall, and I have made a slight change in it, Mr. Chairman. It now amounts to $1,008,000, and the following are the items of the estimate: Services of assistants to the Ordnance Board, $10,000; services of employees engaged in current work, including skilled mechanical labor, $200,000; services, materials, and supplies required for the maintenance of proving ground, patrol boats and steamers, $100,000; services, materials, and supplies required for the maintenance of railroad transportation, $298,522; services, materials, and supplies required for making repairs and alterations incident to testing and proving ordnance and ordnance, including repairing butts and targets and clearing and grading ranges, $250,000; purchase of instruments and other supplies, $50,000; total for these items, $908,522. These items pertain to the Sandy Hook and Aberdeen Proving Grounds. We are also carrying an item of the same general character totaling $100,000, for the Savannah Proving Ground, making a total of $1,008,522.

Mr. BORLAND. When do you expect to begin to use the Savanna Proving Ground?

Gen. RICE. It is under very rapid construction now and we expect to do the proving of the matériel that is delivered and the ammunition that is delivered in that part of the country whenever it comes through, which should be either in June or July. Of course, we will do proving while the proving ground is still being developed, just as we did at Aberdeen.

Mr. BORLAND. Then you expect to operate it continuously during the fiscal year 1919, beginning the 1st of July?

Gen. RICE. Yes, sir. I would like to say in further explanation, that the work of the proving grounds is perfectly enormous. These items pertain to the regularly established proving grounds of the department. In addition to these, we are finding it necessary to establish temporary proving grounds all over the country to handle the proving work for the ammunition and matériel which is being produced. At Aberdeen alone our estimate is that by October we will fire something like an average of 12,800 rounds a day and a maximum of 16,000 a day. That means that a very great deal of work must be done and there must be a very large force to do it. So that my fear in this estimate is that it has been too modest rather than too large.

Mr. BORLAND. What is being done at the old Russian proving ground at Lakewood, N. J.?

Gen. RICE. That is being used under our department as an experimental proving ground for gas shell.

Mr. BORLAND. Is that taken care of out of this item?

Gen. RICE. No, sir; that is going to be paid for out of the manufacturing appropriations, similar to the other local and temporary proving grounds established throughout the country for war purposes alone.

Mr. BORLAND. You class that as a temporary proving ground?

Gen. RICE. Yes, sir; we are merely leasing it.

Mr. BORLAND. Nothing is proved there except gas shells?

Gen. RICE. That is all.

Mr. BORLAND. You have a place at Aberdeen devoted to gas shells, have you not?

Gen. RICE. Not for proving gas shells; no. On the Aberdeen reservation we have a gas manufacturing and filling establishment, but the experimental work in connection with the shells after they are filled is done at Lakewood.

Mr. BORLAND. What is the experimental work in connection with the gas shells?

Gen. RICE. It involves a good many things. They have to try out the effect of the shell to determine what the instructions should be; for instance, as to the closeness with which they should be used to cover a given area in order to get the proper strength of the gas, to see how many yards apart the shell would have to be planted in order when they burst to have a sufficiently strong amount of gas to do the work; they have to try them out for the effect of the explosive charges and boosters, and all those things, to determine that they are strong enough to burst the shell and yet not so strong that they will disintegrate the gas when they burst. Then, they are constantly trying out new compositions and everything of thst kind. It is quite a job.

Mr. BORLAND. That could not be combined, of course, with the ordinary proving-ground work?

Gen. RICE. No, sir. The original idea was to put it on Gunpowder Neck, which is a part of the Aberdeen Proving Grounds, but we abandoned that and moved it over to Lakewood because of the fact that we really could not combine the two things because of the danger and the interference.

Mr. BORLAND. At Aberdeen you are planning to put in a proving ground for aviation bombs?

Gen. RICE. Yes, sir.

Mr. BORLAND. When do you expect to have that in operation?

Gen. RICE. We are going to have it in operation within a month.

Mr. BORLAND. Have you your funds for that purpose?

Gen. RICE. No; we are using manufacturing appropriations until we get them. We either had to do that or shut down the proving works.

Mr. BORLAND. When you finally get that aviation field laid out, will that become a charge upon this appropriation?

Gen. RICE. Its maintenance will; yes.

Mr. BORLAND. Have you figured that in as one of your items?

Gen. RICE. Yes, sir.

Mr. BORLAND. What class of work do you expect to do at Savanna?

Gen. RICE. We are going to carry on certain experimental work in connection woth the manufacture of field artillery matériel at the Rock Island Arsenal. We are going to test there all of the ammunition which is manufactured in that part of the country.

Mr. BORLAND. That will not include any heavy guns, will it?

Gen. RICE. Not very heavy. We expect to proof-fire some guns that are being manufactured at Minneapolis. They are 155-millimeter French guns, but the high-explosive shells of the larger caliber will probably not be tested at Savanna. The proving ground is not very wide and we will be very careful to look out for that feature of it.

Mr. BORLAND. You are moving the work from Sandy Hook down to Aberdeen as rapidly as Aberdeen is ready for it, are you not?

Gen. RICE. Yes, sir.

Mr. BORLAND. Do you eventually expect to move all of the work from Sandy Hook?

Gen. RICE. Yes, sir.

Mr. BORLAND. Of course, during the present stress of work you are using both Aberdeen and Sandy Hook?

Gen. RICE. Yes, sir.

Mr. BORLAND. To full capacity?

Gen. RICE. Yes, sir.

Mr. BORLAND. But as the work falls off you will curtail the work at Sandy Hook until gradually it will be eliminated?

Gen. RICE. That will be the case, but I do not think it will be entirely eliminated during the war, for the reason that the amount of ammunition and the amount of matériel of the lighter calibers to be tested for acceptance will be so great in the neighborhood of New York or within easy reach of it that we will probably need to use Sandy Hook for acceptance tests for some time to come—in fact, during the war. We are going to abandon Sandy Hook as fast as we can and build at Aberdeen, and Sandy Hook is now being used very largely for supply purposes.

Mr. **Slemp**. Would you mind giving an analysis of the use of 12,000 shells per day in testing—just what you mean by that?

Gen. **Rice**. The biggest item in it is the proving of ammunition received from contractors. One-half of 1 per cent of all the ammunition we obtain under procurement purchases is fired from the guns for test, and, of course, as the deliveries of the ammunition begin to come in the number of rounds fired per day goes up very rapidly, so that a very large part of this pertains to that.

Mr. **Slemp**. Is that a loss on the part of the manufacturers, or on the part of the Government?

Gen. **Rice**. The firing of those rounds?

Mr. **Slemp**. I mean the shells themselves.

Gen. **Rice**. That is paid for by the Government.

Mr. **Slemp**. So that the 12,000 shells are a part of the manufacturing cost?

Gen. **Rice**. A part of the manufacturing cost; yes.

Mr. **Slemp**. While you are testing the shells you are also testing the different makes of guns?

Gen. **Rice**. Sometimes we combine them. We are not always able to do so on account of the time element. In order to do both things at once they have to be needed at once or in preparation at the same time, but we do combine the testing of the gun and carriage with the testing of the ammunition whenever it is possible to do so.

Mr. **Slemp**. You would send the shells away after they had been tried and determined upon as you have stated, but would you send any guns away without each one having been submitted to an individual test?

Gen. **Rice**. No.

Mr. **Slemp**. They are all submitted to an individual test?

Gen. **Rice**. Yes; there is a regular program for each gun involved; some 10 rounds, I think, or from 5 to 10 rounds, under various conditions.

Mr. **Slemp**. Then those guns would have to be transported to the proving grounds?

Gen. **Rice**. Yes, sir.

Mr. **Slemp**. I suppose that would be done just prior to their being shipped abroad?

Gen. **Rice**. Normally; it depends upon the condition of the supply. We try to make tests of the ammunition depend entirely upon the time of its delivery, because it must be tested immediately, for the reason that the acceptance of certain lots depends on it, and great delay would occur if it was not, so that we must try to make the tests as soon as the ammunition comes in. The guns and carriages are tested as rapidly as possible in order to make them available for any use that may come up, but under present conditions we would probably ship them abroad immediately. Our supply later on will be such that there will not be the same need for immediate shipment abroad that there is now, in which event we would store them and have them available for shipment whenever desired.

Mr. GOOD. What portion of the $690,000 which you had available this year was spent for clearing and grading ranges?

Gen. RICE. $25,000.

Mr. GOOD. Can you state approximately the number of acres in each of these two new proving grounds?

Gen. RICE. The Aberdeen Proving Ground is about 17 miles long and at its widest place is probably 3 miles wide.

Mr. GOOD. It contains about 35,000 acres, as I understand.

Gen. RICE. Something of that kind.

Mr. GOOD. Do you remember how many acres are included in the Savannah Proving Ground?

Gen. RICE. It is something like 10 miles long with a maximum width of 2 miles.

Mr. GOOD. What is the size of the proving ground at Sandy Hook?

Gen. RICE. That is 4 or 5 miles long by, I guess, not more than three-quarters of a mile at its widest point.

Mr. GOOD. After this emergency has passed what is it proposed to do with the Sandy Hook Proving Ground?

Gen. RICE. It will probably be turned over to the Artillery forces at Fort Hancock, which is on the same Government reservation, and is now very much cramped. That is one of the reasons for moving it, as well as the fact that Fort Hancock is in a dangerous position because of the work of the proving ground.

Mr. GOOD. Can you put in the record a statement showing the cost of the proving ground at Aberdeen and the proving ground at Savanna and giving the cost of the improvements in the way of grading and building up to this time, so that we may keep a history of those places.

Gen. RICE. Yes, sir. I happen to know what those figures are now. There was appropriated for Aberdeen $7,000,000 and that total amount has practically been expended for construction, grading and establishing the proving grounds, and of that amount about $3,600,000 will be spent for land.

Mr. GOOD. The other $4,000,000 went into buildings, equipment, grading, and things of that kind.

Gen. RICE. Yes; and in the establishment of ranges, etc.

Mr. GOOD. And that included the building of the railroad?

Gen. RICE. Yes, sir.

Mr. GOOD. How about the Savanna Proving Ground?

Gen. RICE. The appropriation was $1,500,000; the land cost in the neighborhood of $900,000 and the remainder of the appropriation will be spent for the improvements, and that is all that will be spent on it.

Mr. BORLAND. Do you know what the relative difference in the cost of the Aberdeen Proving Ground was and the one proposed at Kent Island?

Gen. RICE. No; I do not.

Mr. BORLAND. My recollection is that the Kent Island amount was less than half the cost of Aberdeen.

Gen. RICE. My impression is that it was cheaper.

PROVING GROUNDS, EXPENSES OF OFFICERS.

Mr. **Borland**. You have an item:

> For necessary expenses of officers not occupying public quarters at the proving grounds, while employed on ordnance duty thereat, at the rate of $2.50 per diem while so employed, and the compensation of draftsmen while employed in the Army Ordnance Bureau on ordnance construction, $150,000.

You had an appropriation of $35,000 in the 1918 bill and an appropriation of $100,000 in the deficiency act.

Gen. **Rice**. We have a considerable balance under that appropriation and we are withdrawing the request for any appropriation at all.

Mr. **Borland**. How much of a balance have you?

Gen. **Rice**. There have been two appropriations; under one we have $19 906, and under the other we have $47,500.

Mr. **Borland**. $67,400 in all?

Gen. **Rice**. Yes, sir. We consider that that will be sufficient for the purposes of this appropriation.

Mr. **Borland**. You want to withdraw the estimate of $150,000 made this year?

Gen. **Rice**. Yes, sir.

Mr. **Byrns**. To what extent have you been unable to provide public quarters for officers?

Gen. **Rice**. This applies only to the Sandy Hook Proving Ground, and we could not supply practically any public quarters for the officers down there except in one building; we had one or two other buildings, but there was only a sort of bachelors' quarters, where there was room for some of the officers, but the providing of quarters in the usual sense was not practical at all beyond that. This appropriation, so far as it pertains to the officers, will disappear as soon as the Sandy Hook Proving Ground is abandoned.

Mr. **Byrns**. Do you provide public quarters for the officers at the other proving grounds you have mentioned, Aberdeen and Savanna?

Gen. **Rice**. We are providing them with rooms 10 by 6, something like that, in cantonment construction, but we are providing some way for the officers themselves to live, and it is not expected to ask for this $2.50 a day.

Mr. **Byrns**. Is it proposed to provide permanent quarters at the providing ground at Aberdeen?

Gen. **Rice**. Perhaps some day, but we can not do it during this war.

Mr. **Borland**. What is meant by "and the compensation of draftsmen while employed in the Army Ordnance Bureau on ordnance construction?" Why is that combined with this expense of officers or is it a part of the same expense?

Gen. **Rice**. No, sir; it is an entirely different expense and why it is combined I do not know. I have been in the Ordnance Department for 18 years and this goes back beyond my time. However, the fact in regard to it is that funds appropriated under this item have been used for those two individual things—a part for paying this $2.50 a day and a part for the pay of draftsmen in the Ordnance Office. Under present conditions we are able to pay draftsmen in the Ordnance Office out of other appropriations, so that is not so important and I am not making any claim for it at this time.

Mr. **Borland**. But it makes the money available for that purpose?

Gen. **Rice**. Yes; it could be used for that purpose.

Mr. **Borland**. And is in addition to a great many other funds available for that purpose.

Gen. **Rice**. Yes, sir.

Mr. **Borland**. Originally this item started off at $9,500, so that it did not make any difference whether a few odds and ends were thrown in, but now it has gotten up to $150,000.

Gen. **Rice**. It is up to nothing this year.

Mr. **Borland**. How much of this item is devoted to the compensation of draftsmen employed in the Ordnance Bureau? Does your record show?

Gen. **Rice**. I will have to put it in the record for the last year. Generally in the past there has been approximately half of it; but what the record is for the last year I can not say without looking it up. From July 1 to May 10, $69,000 was spent for this purpose.

PURCHASE, MANUFACTURE, AND TEST OF SEACOAST CANNON, INSULAR POSSESSIONS.

Mr. **Borland**. Your next item is "For purchase, manufacture, and test of seacoast cannon for coast defenses, including their carriages, sights, implements, and equipments," in the insular possessions. The same question arises here in regard to the language "and the machinery necessary for their manufacture at the arsenals." You only want to cut out the words "at the arsenals"?

Gen. **Rice**. Yes, sir.

Mr. **Borland**. This item is entirely devoted to the insular possessions?

Gen. **Rice**. Yes, sir.

Mr. **Borland**. You had a total of $1,677,000 in the fortification and deficiency bills. What is the condition of that appropriation?

Gen. **Rice**. The treasury balance under the general bill is $298,931.55, and under the act of June 15, $1,048,132, a total of $1,347,063.55; due on contracts, etc., from the regular bill, $201,466.84, and under the act of June 15, $49,786, a total of $251,252.84; the unallotted balance under the regular bill is $97,464.71, and under the act of June 15, $998,346, a total of $1,095,810.71. Under the contract authorization a total of $59,000 is obligated.

Mr. **Borland**. If you transfer your contract obligations to your unallotted cash on hand you still have an unallotted balance of $1,036,000?

Gen. **Rice**. That is correct.

Mr. **Borland**. What is the explanation for not using all of those funds? Have you been subordinating your purchases and manufacture of seacoast cannon to the artillery for field use?

Gen. **Rice**. Yes, sir. * * *

Mr. **Borland**. Where did you expect to use that railroad unit?

Gen. **Rice**. In Hawaii.

Mr. **Borland**. You mean by a railroad unit howitzers mounted on railway mounts?

Gen. **Rice**. Yes, sir; howitzers and guns.

Mr. **Borland**. Those orders have not been placed on account of the capacity being taken up by necessary orders for the war?

Gen. **Rice**. Yes, sir.

Mr. **Borland**. What do you say now about the use which you may have for that $1,036,000?

Gen. **Rice**. I think that we will not be able to use the total amount prior to the time that another appropriation may be expected. We estimate, on the orders which are outstanding and for some accessories and things of that kind that have not yet been ordered but which will be necessary to complete these equipments, that we need approximately $250,000.

Mr. **Borland**. How about the estimate of 1919 of $359,000?

Gen. **Rice**. That will not be needed. We should have left, then, by transferring the amount from the contract authorization to the cash of about $309,000 or $310,000 under this appropriation.

Mr. **Borland**. That is, you want your contract authority to continue in addition to the $250,000?

Gen. **Rice**. I do not consider that necessary. It will give us a little wider safety margin for emergencies.

PURCHASE, MANUFACTURE, AND TEST OF AMMUNITION FOR SEACOAST CANNON, INSULAR POSSESSIONS.

Mr. **Borland**. We come now to the item—

> For purchase, manufacture, and test of ammunition for seacoast cannon, including the necessary experiments in connection therewith, and the machinery necessary for its manufacture at the arsenals.

In 1917 you seem to have received $1,700,000.

Col. **Shinkle**. Mr. Chairman, the history of this appropriation is the same as the history of the appropriation under "Armament of fortifications H," and considerable expenditures during 1917 and 1918 are for the same purpose and bear their proportionate share of the supply of ammunition approved by the board of review. It is is simply a question of the proportion of guns mounted in the insular possessions and the proportion mounted in the continental limits of the United States and at the Panama Canal; and the amounts expended are in the same proportion as the armament in those places.

Mr. **Borland**. First, let us get the condition of your balances. How much, if any, balance have you on hand?

Col. **Shinkle**. The balance from the general appropriation is $394,747.13; under the act of June 15, 1917, the balance is $2,777,075.81, the total cash balance being $3,171,822.94. There are due on contracts, orders, etc., under the general appropriation $335,972.83, and under the act of June 15, 1917, $2,763,556.60, a total due on contracts of $3,099,529.33, leaving an unallotted balance under the general appropriation of $58,774.30, and under the act of June 15, 1917, of $13,519.31.

Mr. BORLAND. What is the total unallotted balance?

Col. SHINKLE. The cash is $72,293.61. As regards contract authorizations, there were authorized under the act of February 14, $1,000,000, and under the act of June 15, 1917, $2,550,000, or a total of $3,550,000. There has been allotted under the act of February 14, 1917, $1,000,000, the total amount, and under the act of June 15, 1917, $2,449,702.10, a total of $3,449,702.10, leaving $100,297.90. Summing the cash and the contract authorizations, there is an unallotted cash balance of $72,293.61 and a contract authorization balance of $100,297.90, or a total of $172,591.51.

Mr. BORLAND. You also received $1,700,000 in 1917?

Col. SHINKLE. Yes, sir.

Mr. BORLAND. Has that been disbursed?

Col. SHINKLE. That has been disbursed. The only cash appropriated for the purchase, manufacture, and test of ammunition for the seacoast cannon, etc., in the insular possessions is the figures I have given you.

Mr. BORLAND. The Board of Review program, which was filed November 26, 1915, called for ammunition in the insular possessions to the amount of $7,384,500. In the fortifications bill and the deficiency bill of 1918, you had a total of cash and contract authorization of $10,879,000. You had in the bill of 1917 $1,700,000, making a total of $12,579,000 which is 65 or 70 per cent more than the total of the Board of Review program.

Col. SHINKLE. I shall have to ask you to allow me to furnish the necessary detailed figures to be entered in the record to cover that apparent discrepancy.

(See statement on page 143.)

Mr. BORLAND. And also tell us to what extent your Board of Review program has now been completed; and whether anything was done with that money that was not contemplated by the Board of Review.

Col. SHINKLE. I may say in partial answer to that question, the ammunition under order will complete practically 100 per cent the Board of Review approved program. It is slightly over, in the case of some calibers, and will be slightly under in the case of some others, but it will be approximately 100 per cent complete.

Mr. BORLAND. I understand that very few, if any, of the guns in the insular possession fortifications have been dismounted for field service.

Gen. RICE. None whatever.

Mr. BORLAND. And at the same time very few guns have been added to the insular possession fortifications, and they remain about as they did.

Gen. RICE. There have been some additions. * * *

Mr. BORLAND. Of the amount of ammunition which you have spoken of here, Colonel, how much has been delivered; what percentage?

Col. SHINKLE. In placing the orders, we do not keep the same items separate for the different appropriation acts, for the reason that they are the same article and the appropriations are lumped and they are ordered together. * * * This is not a great proportion of the total number of rounds, but is a considerable proportion of the total value, because of the considerable number of 12-inch shell included. We are not making any effort to rush the production of this ammunition because of the quite satisfactory state of the supply of seacoast ammunition, at least as compared with the field ammunition.

Mr. BORLAND. You are asking this year for $4,124,000.

Col. SHINKLE. I want to reduce that so that we now ask for $2,775,000, and of this amount $2,550,000 is required to cover the urgent deficiency act of June 15, 1917. As before stated, practically the entire amount of that contract authorization has now been obligated and must be covered. The remaining $225,000 is desired for purchasing new fuses for all the armor-piercing projectiles that pertain to the armament in the insular possessions, for the same reasons I gave this morning in speaking of the armament of fortification estimate for the continental limits of the Unitde States; in other words, this is the proportion that the insular possessions should bear of the total expenditure of something over $1,000,000.

Mr. BYRNS. Colonel, I did not understand your answer to Mr. Borland's question a while ago. Do I understand that you do or do not intend to increase the amount of your reserve over and above the original program contemplated by the Board of Review?

Col. SHINKLE. We do not intend to increase it above that approved by the Board of Review.

Mr. BYRNS. It struck me from the figures that Mr. Borland read that the appropriations you have had and the appropriations you are now asking amount to a great deal more than was originally estimated.

Col. SHINKLE. It does amount to more, and I am not prepared to give the exact figures, but expect to submit for the record those figures in detail. We are only asking now for $225,000 cash in addition to what is necessary to cover the contract authorizations already obligated. This $225,000 of cash is for purchasing fuses, an entirely new article, and replacing defective fuses in service.

Mr. GOOD. I am not quite sure I understand your figures. Last year you received in the regular appropriation $2,229,000 and in the deficiency act you were given $5,100,000, or a total of $7,329,000: and then you were given contract authorizations in the regular fortification bill of $1,000,000, and in the deficiency bill of $2,550,000. Do I understand you have practically used or will have used in paying for material of this character that you have already ordered all of the cash appropriation and $2,500,000 of the contract authorizations?

Col. SHINKLE. That is correct, with the exception of the small balance of $172,000 remaining.

Mr. GOOD. Then you will not use the contract authorization of $1,000,000 which was contained in the original fortification bill of last year, and will not need that?

Col. SHINKLE. I am sure that that contract authorization was covered by the $5,100,000 cash in the act of June 15, 1917.

Mr. GOOD. Then if you have not used that contract authorization of $1,000,000, you will not need it?

Col. SHINKLE. If we had not made use of it, it would appear in these balances under the balance under contract authorization, so that I am sure we have made use of that along with the other contract authorizations, and that the total left under contract authorizations is $100,000.

Mr. GOOD. But you have contract authorizations all told for this purpose of $3,550,000?

Col. SHINKLE. We had that amount; yes, sir. But the $1,000,000 carried in the last regular fortification act was taken up in cash from the act of June 15, 1917.

Mr. GOOD. You are now asking only for $2,500,000 of appropriation to pay those contract authorizations, so evidently you have not used the $1,000,000 contract authorization contained in the fortification bill.

Col. SHINKLE. The $1,000,000 was used, but later covered by cash from the funds given us in the urgent deficiency act of June 15, 1917.

Mr. GOOD. I would like to ask in reference to the delivery of the particular ammunition you are getting with this appropriation and within what time you expect to have to meet these contract authorizations?

Col. SHINKLE. I gave the approximate delivery of shell, and I may say in a general way that that will be allowed to take care of itself and to take second place to field artillery ammunition. If it can be procured during this fiscal year without interference with the more important field artillery ammunition it will be done; but where there is interference the field artillery ammunition will have preference, and it is rather hard to estimate what deliveries will be made within the present fiscal year. I should say, however, that in most calibers a great part of it will be delivered within this year, and the powder, of course, necessary to shoot that number of shell will be furnished at the same time.

Mr. GOOD. That is consistent with your idea that we would eventually produce more than we needed for our other guns?

Col. SHINKLE. It will be some time, and I doubt if it will occur within this fiscal year, when we will produce more of the larger caliber shell than we will need abroad, but these are quite a different proposition from the field shells. They are more expensive, they require longer time to make, and where they are in the same plant as the field shell, they are apt to interfere seriously with them, and wherever that occurs the field shell will have the right of way.

Mr. GOOD. You are not contemplating commencing modernizing these shells during the next fiscal year like you are planning others for the United States?

Col. SHINKLE. The shell now being manufactured, we think, are as modern as we know how to make them, and I think all of the shell of the older type have had the wind shields put on them, and this does not contemplate altering any shell, nor does the similar appropriation for continental United States contemplate that. We expect to replace the fuses in all armor-piercing shell.

Mr. GOOD. Are you going to replace the fuses in this ammunition?

Col. SHINKLE. Yes, sir; and that is the reason for asking for the $225,000. That is the proportion this item should stand of that change which will be universal.

Mr. GOOD. Why was not that change made at the time they were manufactured?

Col. SHINKLE. These fuses were designed some 20 years ago, and the design was good for that day, but they have deteriorated in service, for one thing, and they are not in style any longer. They have deteriorated partially because of their design and partially because of the far from ideal storage conditions under which they have been stored all these years. The deterioration due to storage leads to malfunctioning; that is, failing to perform their proper function at the right time; in the case of the instantaneous fuse failing to function at all, and in the case of the delay fuse, either failing to function or failing to delay.

Mr. GOOD. Are you speaking now of the shell that are in reserve or these new shells that you have under contract?

Col. SHINKLE. The shells in reserve. I am speaking of the reason for replacing the fuses. In regard to their design, we have recently had quite a few premature explosions from fuses. These fuses have no protection to hold the detonator in a safe position in case it should fire prematurely in the gun, and if that does occur, the gun and crew and probably the carriage will be lost, and not only damage to material result, but there will be the injured morale of the troops.

Mr. GOOD. Are the new shells that you are getting under the appropriations of last year equipped with the modern fuse which is up to date?

Col. SHINKLE. The decision to change the fuses has but recently been reached, and they were ordered with the old type of fuse. The orders for the fuses have now been canceled and the new type of fuse, with the bore safety device, will be substituted and will be paid for from the funds that buy the shells, as those funds were sufficient to include the fuses.

Gen. RICE. The $225,000 will not be used for the shells now being procured.

Col. SHINKLE. But will be used for the shell now in the fortifications.

ALTERATION AND MAINTENANCE OF SEACOAST ARTILLERY, INSULAR POSSESSIONS.

Mr. BORLAND. Your next item is, "For alteration and maintenance of the seacoast artillery, including the purchase and manufacture of machinery, tools, and materials necessary for the work, and expenses of the civilian mechanics, and extra-duty pay of enlisted men engaged thereon."

You had $494,510 in the fortification bill for the current year and $700,000 in the deficiency bill. What is the state of your balances under those appropriations?

Gen. RICE. The Treasury balance under the regular appropriation bill was $342,284.57, and under the act of June 15, $697,403, a total of $1,039,687.57; due on contracts, orders, etc., from the regular appropriations, $179,332.14, and from the act of June 15, $566.98, a total of $179,899.12; the unallotted balance from the regular appropriation is $162,952.43, and from the act of June 15, $696,836.02, a total of $859,788.45.

Mr. **Borland.** Did the estimates under those amounts include any material alteration, or was it largely for maintenance?

Gen. **Rice.** The estimates for the regular bill included both alterations and maintenance.

Mr. **Borland.** What class of alterations were included?

Gen. **Rice.** There was the alteration of 12-inch gun carriages and 14-inch gun carriages for higher elevation, and certain other changes not so important, and the provision of some spare guns for the fortifications.

Mr. **Borland.** Your not securing the railway artillery is the occasion for your having such a large balance unexpended?

Gen. **Rice.** Yes, sir.

Mr. **Borland.** You expended approximately $334,000?

Gen. **Rice.** Yes, sir; and for the insular possessions the items were similar to those for the continental United States.

Mr. **Borland.** Is there any increased expenditure for the maintenance of the seacoast guns in the insular possessions due to the war? Are you using those guns to any larger extent than you did in time of peace?

Col. **Brigham.** Yes, sir; we are using them to a larger extent; that is, in the way of drills because of a slightly increased personnel. However, their use has not greatly increased over peace times, because in the insular possessions there has been practically the same amount of target practice as in time of peace.

Mr. **Borland.** What is the need now for that $859,000 of free balance?

Gen. **Rice.** I think we should retain $100,000 of it.

Mr. **Borland.** Would not that be a good deal?

Gen. **Rice.** That is a liberal allowance, but I do not think it is more than we will need and I would rather not reduce it below that. In peace times we have had, for the last two years, $60,000, and that has never been sufficient. We have had to try and piece it out or let things go because we were having difficulty in finding enough money to meet the needs. I think there will be some increase in cost due to the war and that you should not give this year below $100,000. There are still some expenses left for this fiscal year.

Mr. **Borland.** What do you say about the estimate of $200,000 for this year?

Gen. **Rice.** That should be omitted.

Mr. **Borland.** You think your maintenance item for the insular possessions ought to run about $100,000 instead of $60,000, as previously?

Gen. **Rice.** I think we should have that amount on hand; yes, sir. I am not sure that we will need all of it, but I know that we have had a very hard time in keeping the matériel out there in good condition with the $60,000 which we have heretofore had.

Mr. BORLAND. When do they go into commission?

Gen. RICE. They are in commission now. They were proof-fired in the early part of January.

Mr. BORLAND. General, have you received any allotments from the President's $100,000,000 fund?

Gen. RICE. The Ordnance Department received allotments from it, but not for any purpose of seacoast armament, nor do I know exactly how much was received. I think nearly all that was obtained from that fund was returned to it.

Mr. BORLAND. That fund, so far as used by the Ordnance Department, went into field artillery and ammunition, did it not?

Gen. RICE. Yes, sir.

ORGANIZATION OF ORDNANCE DEPARTMENT.

(See p. 191.)

Mr. BORLAND. You do not have anything to do with the actual making of the contracts for these supplies, do you?

Gen. RICE. No, sir; beyond furnishing certain information. We furnish drawings, specifications, and technical assistance that may be needed by the purchasing officers, but so far as the form of the contract is concerned and the selection of the contractors, we have practically little to do with it.

Mr. BORLAND. That is under the procurement division?

Gen. RICE. Yes, sir.

Mr. BORLAND. Do you have anything to do with the operation of the arsenals?

Gen. RICE. Only so far as it pertains to the manufacture of experimental material. All experiments, tests, and development work are in the engineering bureau, at arsenals or anywhere else, so that as far as that goes we have relations with the arsenals.

Mr. BORLAND. When was your engineering bureau organized?

Gen. RICE. January 14.

Mr. BORLAND. Of this year?

Gen. RICE. Yes, sir.

Mr. BORLAND. Prior to that time what was your form of organization in the Ordnance Department?

Gen. RICE. We had a division of duties and a separation into divisions along the line of the class of articles, that is to say, one division would handle all of the business of design, procurement, inspection, and production of gun carriages, we will say; when they had been produced, delivered, and payments had been made they were turned over to the supply division—which acted for the whole department—for issue to the troops. Some other division might handle cannon, ammunition, trench warfare, and certain other items which were given to that division and would have the whole job. As it is now we are divided on functional lines.

The engineering bureau has the design, development, and test of all material for the Ordnance Department, guns, carriages, ammunition, explosives, equipment, and everything; they make specifications and drawings and prescribe what shall be procured, that is, the type that shall be used. The procurement division handles the manner of placing contracts, finding contractors, and placing the orders with them and executes the contracts. The production division follows up the orders after they are placed and looks out for plant facilities, sees that everybody has transportation and fuel, if it is possible to get it, and does everything that can be done to assist the manufacturers in making deliveries. The inspection division is charged with the determination of whether the goods being delivered by manufacturers are delivered in quality in accordance with the drawings and specifications. There is now, as there was before, the same supply division, which issues the articles after they have been delivered.

Mr. BORLAND. What does the Control Bureau do?

Gen. RICE. The Control Bureau is the supervisory and coordinating element for all the others. Perhaps I might call it the operating control of the Chief of Ordnance.

Mr. BORLAND. If you have only the question of designs in your division how are you able to come here before us with a statement of the accounts under these appropriations?

Gen. RICE. I will probably not be the one who comes to any further hearings. I came to this one because in the past I had another division which had to do with this whole subject so far as it pertains to carriages.

Mr. BORLAND. I am glad to have you, General, but I am trying to get at how many of these people we want to hear and who we want to hear.

Gen. RICE. As far as these items which we have gone over are concerned, I think it will not be necessary to hear anybody else. We can get any of this information, of course, from the other divisions if we do not have it ourselves. These estimates were made up and submitted before the reorganization of the department, and in the days before the reorganization I made up myself all of the estimates that covered my division, so I was quite familiar with the situation, and the Control Bureau, where the making of estimates is now located and with whom you will have to deal in the other hearings that you have, had not taken over this class of work at the time the hearings became necessary.

FRIDAY, MAY 17, 1918.

OPERATION AND MAINTENANCE OF FIRE-CONTROL INSTALLATIONS, UNITED STATES.

STATEMENT OF BRIG. GEN. C. McK. SALTZMAN, THE SIGNAL CORPS, UNITED STATES ARMY.

Mr. BORLAND. "For operation and maintenance of fire-control installations at seacoast defenses."

You had $140,000 under the fortification act of 1918?

Gen. SALTZMAN. Yes, sir.

Mr. BORLAND. Will you give us your balances under that appropriation?

Gen. SALTZMAN. The last report that I had was that on April 30 we had a Treasury balance of $11,000. Since that time the entire appropriation has been obligated.

Mr. BORLAND. General, what use is made of this money?

Gen. SALTZMAN. These funds are divided up in expenditures covering salaries, incidental expenses, the operation of district signal stations, including radio equipment and other signal equipment, submarine cables and reels, aerial and subterranean cable and reels, post telephone systems, fire-control apparatus, including telephones, time-interval apparatus, meteorological equipment, zone and firing signals, power equipment, including generators, storage batteries, power switchboards, testing instruments and tools, construction and other expendable material, including wire poles, dry cells, etc., photographic supplies, laboratory supplies, and the funds incident to the operation and maintenance of the cable ship which repairs all fire-control cables.

Mr. BORLAND. Does your department simply maintain these appliances in working order, or does it also provide the personnel to operate them?

Gen. SALTZMAN. We are simply a supply corps which fills the requisitions which we receive. The maintenance of these fire-control systems is in the hands of the Coast Artillery. We are simply a supply corps that furnishes them with the materials which they ask for on requisition.

Mr. BORLAND. Do you install the systems?

Gen. SALTZMAN. No, sir.

Mr. BORLAND. And you do not operate them after they are installed?

Gen. SALTZMAN. No, sir.

Mr. BORLAND. This money, then, is spent for supplies for the upkeep of these fire-control and other electrical systems?

Gen. SALTZMAN. Yes, sir.

Mr. BORLAND. Why are you asking for $180,000 for the next year?

Gen. SALTZMAN. For the general reason that the price of the equipment such as we furnish is going up all the way from 25 to 75 per cent.

Mr. BORLAND. Is not the use of the material decreasing a little on account of the absence of some of the batteries?

Gen. SALTZMAN. It may; yes, sir. We do not know the exact demands which are going to be made upon us, and this estimate just represents our opinion as to what demands are going to be made upon us for material during the coming fiscal year. We have not put that figure of $180,000 as high as we would have put it, based on the general rise in the price of apparatus and equipment, if as great a demand would be made upon us for equipment as has been made in the past. If the demand upon us for equipment and supplies would be as great during this coming fiscal year as it was last year, we would have to ask for more than $180,000 on account of the increased cost of all kinds of equipment, such as cable, telephone equipment, and all kinds of electrical apparatus.

Mr. **Borland**. This item is expressed to be for operation and maintenance, and yet no part of the money is applied to the operation of this equipment.

Gen. **Saltzman**. There are some supplies bought which are used, of course, in the operation. For instance, storage batteries and all that sort of thing, although we furnish them simply in maintaining these things, yet they are used in the operation of these batteries. I think the word " operation " was originally put in there due to the fact that many of these supplies are vital to the operation.

Mr. **Borland**. You spoke of an item for personal salaries, did you not?

Gen. **Saltzman**. Yes, sir.

Mr. **Borland**. What are they for?

Gen. **Saltzman**. In 1917 we paid out $35,015.50 for salaries in this work in the United States. They involve the services of electrical engineers, clerks, plant engineers, electrical assistants, draftsmen, storekeepers, and also wages to machinists, electrical machinists, packers at the depots and packers' assistants, machinists' helpers, and some other skilled and unskilled labor on duty at depots and other places where this equipment is stored, issued, and installed.

Mr. **Borland**. Is that list of employees entirely devoted to this kind of work?

Gen. **Saltzman**. Some of these employees are employees of the Signal Corps, who also do other kinds of work; but great care has been exercised to have the allotment of salaries so that the pro rata share of this money would correspond to the pro rata work done by those employees in the maintenance of fire-control systems. In the office of the Chief Signal Officer, for instance, there are certain engineers, we will say, who are paid from these funds and certain engineers who are paid out of the regular Signal Corps appropriation. It is hardly practical to take this first man, who is paid out of this maintenance fund, and say, " You will not do anything else but just this work." because these men have different specialties, and they do general work both in this maintenance work and for the Signal Corps proper. I think, however, great care has been taken to arrange this salary list so that the amount of funds paid to these employees generally corresponds to the amount of work they do in the fire-control work.

Mr **Borland**. Then, you are charging against this fund a proportionate amount of the overhead of your office and of your supply depot?

Gen. **Saltzman**. Yes, sir.

Mr. **Borland**. On what percentage do you arrive at that? Can you put into the record how much is the total amount of disbursements under this appropriation?

Gen. **Saltzman**. Yes, sir; I can work that out for you; but I can not give it offhand.

Mr. **Borland**. How much is the proportion of the salary list chargeable to the general appropriation and how much is chargeable to this item?

Gen. **Saltzman**. Yes.

Statement of salary of civilian employees on fire-control work, showing the proportion of salary chargeable to the appropriation "Operation and maintenance of fire-control installations at seacoast defenses" and the proportion chargeable to other appropriations.

The following is a list of civilian employees engaged in fire-control work, based on the estimates for the 1919 appropriation. Column 2 shows the total rate of pay per annum, column 3 the number of employees in each grade, estimated, 1919, column 4 the total amount paid these employees in each grade from the appropriation "Operation and maintenance," etc., and the fifth column the amount paid from other appropriations:

1	2	3	4	5
Salaries:				
Electrical engineers	$2,000	3	$3,000	$3,000
Do	1,800	3	2,700	2,700
Clerks	2,000	2	1,000	3,000
Do	1,800	2	900	2,700
Do	1,600	2	800	2,400
Do	1,500	2	700	2,300
Do	1,400	6	2,100	6,300
Do	1,200	19	5,000	17,800
Do	1,000	24	4,500	19,500
Assistant electrical engineers	1,600	3	2,400	2,400
Do	1,500	6		9,000
Plant engineers	1,800	1		1,800
Vehicle engineer	1,500	1		1,500
Electrical assistants	1,200	7	4,200	4,200
Draftsmen	1,600	2	1,600	1,600
Do	1,200	1	600	600
Storekeepers	1,200	2	600	1,800
Clerks, messengers, telegraph operators, and charwomen, from $900 to $240		10	700	6,500
Wages:				
Machinists	1,500	2	1,500	1,500
Electrical machinists	1,200	5	1,500	4,500
Do	1,000			
Chief packer	1,400	1	280	1,120
Do	1,200	1	240	960
Do	1,000	1	200	800
Packer	1,200	1	240	960
Packers, machinist's helper, electrician's helper, skilled and unskilled laborers, from $900 to $680		35	5,240	22,760
Salaries			30,800	119,900
Wages			9,200	41,800

The above table shows about 25 per cent of the salaries and wages of civilian employees engaged on fire-control and other work paid from "Operation and maintenance funds."

Mr. Borland. There has been no increase in that item, has there?

Gen. Saltzman. No, sir; in fact, we have figured on salaries $5,000 less than was expended in 1917, and up to the present time our allotment for salaries in the fiscal year 1918 has been $23,749.99, and we are asking for practically that same sum for next year.

Mr. Borland. I notice you have $5,000 less in salaries than you had in 1917, and it looks as though you had more people. I do not see just how you figure that out. Of course, you are not charging the whole salary of those people to this item?

Gen. Saltzman. No, sir; we have made every effort to prorate the work of these employees. That matter has been the subject of considerable comment in past hearings and we have made every effort to see that only a pro rata share of the overhead was charged against this maintenance appropriation.

Mr. Borland. You are asking substantial increases here on the cost of material.

Gen. Saltzman. Yes.

Mr. **Borland**. What is the *Joseph Henry*, which you operate?

Gen. **Saltzman**. The *Joseph Henry* is a cable ship which was built by the Quartermaster Corps and is on duty along the Atlantic coast. It travels about from place to place repairing submarine cables in connection with the fire-control systems. That is its sole duty.

Mr. **Borland**. It is entirely devoted to the fire-control systems?

Gen. **Saltzman**. Yes, sir.

Mr. **Borland**. Is its personnel paid out of this appropriation?

Gen. **Saltzman**. Yes, sir; all the technical personnel on that ship which is devoted to fire-control work. Of course, the crew which run the ship are paid out of quartermaster funds. The *Joseph Henry* is really a small transport. It is carried in the same general class as a transport, but it is devoted to technical work in connection with the maintenance of this fire-control cable, and all the technical men on board are paid from this fund.

Mr. **Borland**. What do you do on the Pacific coast?

Gen. **Saltzman**. On the Pacific coast the Signal Corps has a large cable ship known as the *Burnside*. The *Burnside* has been used at times to repair cables that required a ship of that size, but in general that work is done by improvised methods; mine planters help out at times, and sometimes it has been necessary to rent a tug and a flatboat. Of course, there is not as large a number of cables on the Pacific coast as we have on the Atlantic coast.

Mr. **Borland**. What are these cables that you repair—mine cables?

Gen. **Saltzman**. No, sir; in general these cables are telephone cables connecting the various observation stations in the coast defenses. There is a large number of them in seacoast defense. A few of them are rubber-covered cables, but most of them are lead-covered, paper-insulated cables crossing stretches of water connecting primary and secondary stations together.

Mr. **Borland**. And are they in such a position that they have to be attended to by a boat?

Gen. **Saltzman**. When these cables are originally laid there is always consideration given toward laying them in such way that they will be out of the way of the anchors of boats, which might drop on them; but each year it always occurs that at a number of places, due to boats dropping anchors on them, due to shifting by tide and storms, that a little leak occurs in one of these cables and it is necessary for the cable ship to go down and pick up the cable and cut out a part of it and put in some new cable and make repairs.

Mr. **Good**. Is there any increased cost in maintaining the fire-control installation at the seacoast defenses occasioned by the present emergency?

Gen. **Saltzman**. I do not think so, Mr. Good.

Col. **Hase**. I should like to state there, if I may, because I am familiar with it, that there is, sir, because of the fact that in former years we only had a small percentage of the batteries in each coast defense manned; but now, since the National Guard Coast Artillery are in the fortifications and we have every single battery in the fortifications manned, there is naturally more wear and tear on the apparatus, and hence the upkeep is larger. Gen. Saltzman is not familiar with that proposition, I believe, so he did not realize that all our battries are now manned.

Gen. SALTZMAN. Of course, we simply get the requisitions from the Coast Artillery for supplies, and of course the Coast Artillery authorities know more about what is going to be done during the year than we do. We know very little about that.

Mr. GOOD. How much of an increase has there been on an average in the cost of these supplies over the price that was paid, say, in 1915?

Gen. SALTZMAN. I should say increases all the way from 25 per cent to 75 per cent in the different classes of equipment.

Mr. GOOD. Your increase in the estimate, then, is accounted for largely on account of the increased cost of materials?

Gen. SALTZMAN. Yes, sir.

OPERATION AND MAINTENANCE OF FIRE-CONTROL INSTALLATION AT SEACOAST DEFENSES, INSULAR POSSESSIONS.

Mr. BORLAND. "For operation and maintenance of fire-control installations at seacoast defenses in the insular possessions" you had, in 1918, $12,500.

Gen. SALTZMAN. Yes, sir

Mr. BORLAND. What is the state of your balances?

Gen. SALTZMAN. On April 30 we had a Treasury balance of $1,334.38. Since that time the entire appropriation has been obligated.

Mr. BORLAND. What is your idea in doubling that amount this year?

Gen. SALTZMAN. The cost of maintaining this apparatus, particularly cables, in the Tropics is greater than it is in the United States, in a temperate zone. The wear and tear on all kinds of equipment in the Tropics is greater than it is in the United States. For a number of years it has been thought in our office, based on requisitions which we received, that this sum annually appropriated for maintenance was not enough, and it was only by the exercise of constant economy that we came out even at the end of the fiscal year. This general thought, coupled with the thought of the increase in the price of equipment, causes us to recommend $25,000 instead of $12,500.

Mr. BORLAND. There has been an increase in the cost of the equipment, and you think there should be an enlarged appropriation regardless of the increased cost of equipment?

Gen. SALTZMAN. Yes, sir; we made a similar request last year for an increase of $5,000.

Mr. BORLAND. The increase you asked last year was not anywhere near as great as the increase now asked for?

Gen. SALTZMAN. No, sir.

Mr. BORLAND. Does the suggestion which is made in regard to continental United States, to the effect that the batteries were all manned by National Guard troops, at the present time apply to the insular possessions?

Gen. SALTZMAN. No, sir.

Mr. BORLAND. Those batteries are not manned by the National Guard?

Gen. SALTZMAN. No, sir.

Mr. BORLAND. And that particular reason for the increase would not apply?

Gen. SALTZMAN. No, sir.

Col. HASE. I would like to interrupt there also, if I may, that the installation at Fort Drum is practically completed, and we are going to man that also, and also the new mortar battery at Fort Hughes; and last August we received a cablegram from the commanding general of the Philippine Department in which he asked for an allotment of $4,000 over the allotment he had for maintaining fire-control installation, but we could not give it to him, because we did not have the money.

Mr. BORLAND. The new batteries at Fort Hughes and Fort Drum ought to be in pretty good condition for the first year.

Col. HASE. That is true, sir, but it is on the same proposition that a man when he goes into a shoe shop and buys a pair of shoes also knows that he has to have new shoe laces and a box of blacking to keep them looking well. I mean, there is a certain amount of repair matériel that is required almost right away.

Mr. BORLAND. Manifestly, as the number of batteries increase the cost of maintenance increases.

Col. HASE. Yes, sir: I do not believe there is any question about that.

Mr. BORLAND. But for the first year the cost of maintenance of a battery ought not to be as great as in subsequent years.

Col. HASE. No, sir.

Mr. BORLAND. General, the same statement you made in regard to the item for continental United States applies also to this item, that your use of this appropriation is confined to furnishing supplies on requisition by the Coast Artillery?

Gen. SALTZMAN. Yes, sir.

Mr. BORLAND. And you have nothing to do with the operation or installation of the equipment?

Gen. SALTZMAN. No, sir. The Signal Corps has, on request by the Chief of Coast Artillery, installed apparatus and equipment at various times. This duty is, however, not the duty of the Signal Corps, and is only done occasionally on request.

ALLOTMENTS FOR FURNISHING EQUIPMENT FOR EXTENSIONS TO BE MADE TO FIRE-CONTROL STATIONS—UNITED STATES.

Mr. BORLAND. General, on page 12 of the committee print it appears that there was a large sum in the fortifications act of 1918 and in the deficiency act of June 15 for the construction of fire-control stations and accessories, which was apportioned among the Engineering Department, the Signal Office, and the Ordnance Department. The amount which was apportioned to your department was $446,761.96, according to my figures. Is that correct?

Gen. SALTZMAN. That was one item that has been allotted to us. These funds are placed to our account for the purpose of furnishing equipment for extensions which are to be made to fire-control installations. We have left unexpended of that sum $298,991.61. There are several fire-control projects in the War Department which are under consideration and which will probably be approved very shortly. As soon as those projects are approved, we will receive the requisitions for the equipment and matériel to do that work, and it is estimated that it will take the full amount of $298,991.61.

Mr. BORLAND. That is, you will be called upon by requisitions to use all of that money?

Gen. SALTZMAN. Yes, sir.

Mr. BORLAND. For work now in progress and contemplated?

Gen. SALTZMAN. Yes, sir.

Mr. BORLAND. You also had an allotment of $117,625 under the regular fortifications bill, did you not?

Gen. SALTZMAN. No, sir; I have $16,025.90.

Mr. BORLAND. Is that all?

Gen. SALTZMAN. Yes, sir. The Chief of Coast Artillery allotted to us $16,025.90 for a similar purpose, and of that amount we have $7.809.38 waiting for further requisitions to be filed. We also received from the appropriation, fire control at the insular possessions, $12,834.38.

Mr. BORLAND. We will get to that in a moment. I want to finish this up first. Your records show that all of the money that was allotted to your department will actually be used in work which is now in progress?

Gen. SALTZMAN. Yes, sir; allotments for furnishing equipment for extensions to be made to fire-control stations, insular possessions.

Mr. BORLAND. We have the same thing for the insular possessions item. Under the regular fortifications bill there was $31,537 appropriated. How much of that was allotted to your department?

Gen. SALTZMAN. Under the item fire control in insular possessions the Chief of Coast Artillery allotted us $12.834.38 to provide equipment and materiel for extensions to fire-control installations in the insular possessions; of that sum we have remaining on hand a balance of $8.541.24, which is awaiting further requisitions from the Coast Artillery.

Mr. BORLAND. You have no means of knowing whether that will be needed or not?

Gen. SALTZMAN. No, sir; that is not known to us. We get requisitions and fill them, but we do not know what there is in contemplation.

Mr. SLEMP. Would you not have to know that before you could make your estimates for 1919?

Gen. SALTZMAN. That work is initiated by the Chief of Coast Artillery. They say, "We are going to have the following work done in the various coast defenses; we want the following equipment and how much is it going to cost?"

Mr. SLEMP. So they make up the estimates themselves?

Gen. SALTZMAN. Yes, sir; for "fire control and fortifications."

Mr. SLEMP. Without reference to you?

Gen. SALTZMAN. Yes, sir.

Mr. BORLAND. If you will turn to page 32 of the committee bill you will find an item of $1,000,000 for contingent expenses, which was contained in the deficiency bill of June 15, 1917. Out of that I understand you have been allotted $49,907.

Gen. SALTZMAN. Yes, sir; we were allotted out of that item $49,907.73.

Mr. Borland. What was done with that amount?

Gen. Saltzman. This sum of money was used in completing installations in the insular possessions and has all been expended except $95.78.

Mr. Borland. Did you furnish the supplies only or did you do the work?

Gen. Saltzman. We furnished the supplies only and on request did some of the work.

Mr. Borland. Your connection with all of this seacoast business is simply in the line of furnishing the supplies?

Gen. Saltzman. We perform the duties of a supply corps; yes, sir.

Mr. Borland. And the amounts that are allotted to you simply represent requisitions made on your depot of supplies for certain material for use in these fire-control stations.

Gen. Saltzman. Yes, sir.

Mr. Borland. That is true as to everything except the *Joseph Henry?* You operate that boat, do you not?

Gen. Saltzman. No, sir. The cable crew of that ship is from the personnel of the Coast Artillery Corps, and the ship's crew, I think, is made up of employees of the Quartermaster Corps.

Mr. Borland. General, have you this item on page 34, "For the purchase, manufacture, maintenance, operation, and repair of airships and other aerial machines, buildings for equipment, and other accessories necessary in the aviation section for use in connection with the seacoast defenses of the United States"?

Gen. Saltzman. The matters pertaining to the training of aviators and the use of military aircraft have been placed by the President in the hands of the Division of Military Aeronautics, under the charge of Brig. Gen. William L. Kenly, National Army. Gen. Kenly is not in the city this morning, but is represented here by Col. H. H. Arnold, Aviation Section, Signal Corps.

Friday, May 17, 1918.

AVIATION IN CONNECTION WITH COAST DEFENSES.

(See p. 121.)

STATEMENTS OF COL. H. H. ARNOLD AND MAJ. H. S. BROWN, AVIATION SECTION, SIGNAL CORPS.

GENERAL STATEMENT.

Mr. Borland. Colonel, we would like to have you make a preliminary statement to the committee in regard to your program for aviation as connected with the coast defenses, because that is the particular jurisdiction of this committee.

Col. Arnold. Our program for coast defenses is based on a letter from the Secretary of War to the Chief Signal Officer, dated August 15, 1917, in response to a memorandum from the Chief Signal Officer to the Chief of Staff of an earlier date, in which it was proposed that there be established a certain number of coast-defense aero squadrons and coast-defense balloon companies. The Secretary of War approved the establishment in the United States of 16 permanent coast defense squadrons, 20 permanent balloon companies, 4 permanent aero squadrons in Panama, 3 permanent aero squadrons in Honolulu——

Mr. Borland (interposing). Who approved that program?

Col. Arnold. The Secretary of War. One balloon company in Panama and one balloon company in Hawaii. He further stated that—

> No aeronautical equipment should be supplied, however, to the Philippine Islands during the continuance of the present conditions, and the supply of such equipment to the other insular possessions and to continental United States should be wholly subordinated to and should not be permitted to interfere with the rapid accomplishment of the program for the supply of aeronautical equipment for operations in France.

And that is our program at this time.

Mr. Borland. And you received an appropriation in the fortifications act of 1918 of $3,600,000.

Col. Arnold. $3,600,000.

UNEXPENDED BALANCE.

(See p. 180.)

Mr. Borland. Has any portion of that been expended?

Col. Arnold. I have no record further back than July 1, 1917. On that date there was turned over for expenditure $2,839,010.98.

Mr. Borland. Turned over to whom?

Col. Arnold. That was available for expenditure on that date.

Mr. Borland. Did the appropriation of $3,600,000 contained in the fortifications bill of 1918 become available on the 1st of July, 1917?

Maj. Brown. The explanation of that is that Col. Arnold's figures are based on the current fiscal year. On the 1st of July, 1917, the unexpended balance of that appropriation was the amount that he has stated, $2,839,010.98. The difference between that and $3,600,000 was expended prior to July 1, between the date of the passage of the act and the present fiscal year.

Mr. Borland. Then we will have to go back to February 14, 1917. What were the expenditures prior to July 1?

Maj. Brown. I have not the details, but I can get them and supply them for the hearing.

Mr. Borland. When can you have that information?

Maj. Brown. I can get it for you this afternoon.

AVIATION SCHOOL AT ESSINGTON, PA.

(See pp. 181, 185.)

Mr. Borland. Have there been any expenditures made since July 1?

Col. Arnold. Since July 1, 1917, there has been expended $24,226.03.

Mr. Borland. For what purpose?

Col. Arnold. $20,000 was expended for the maintenance and operation of a school.

Mr. Borland. Where?

Col. Arnold. That was for a school at Essington, Pa., paid by the disbursing officer at Lake Charles, La.

Mr. Borland. Is that a school of aeronautics for coast-defense purposes, or is it a general school?

Col. ARNOLD. It was a general school for all purposes. We have seaplanes there as well as land planes.

Mr. BORLAND. And some portion of the cost and expense of that school is charged to the coast-defense fund?

Col. ARNOLD. One small portion of it—$20,000.

Mr. BORLAND. How was that arrived at? How did you arrive at the amount to be charged? Did you base it upon the number of men being trained?

Col. ARNOLD. It would be based upon the machines.

Mr. BORLAND. How many seaplanes have you there?

Col. ARNOLD. I do not know the exact number now, but when this allotment was made we had 12.

Mr. BORLAND. Does your record show how many planes are there now?

Col. ARNOLD. They are changing all the time; we are increasing and decreasing the number almost daily; we have smashes to-day and new machines are arriving to-morrow.

Mr. BORLAND. Who has charge of those seaplanes?

Col. ARNOLD. They come under my division.

Mr. BORLAND. Will not your records show how many planes you have there?

Col. ARNOLD. I can give you the total number of planes, but I can not give you the number of seaplanes and land planes.

Mr. BORLAND. Give me the number of planes that were acquired for coast-artillery work. Your records will show the number of planes acquired for this particular coast-artillery work, will they not?

Col. ARNOLD. No, sir; they will not.

Mr. BORLAND. Why not?

Col. ARNOLD. The records will simply show the number of planes there.

Mr. BORLAND. What class of planes do you use for coast artillery work?

Col. ARNOLD. Seaplanes.

Mr. BORLAND. Hydroplanes?

Col. ARNOLD. Yes, sir; and flying boats.

Mr. BORLAND. Do you use those hydroplanes for any other purpose except coast-defense work?

Col. ARNOLD. We have been using them for advanced training for land pilots.

Mr. BORLAND. But you do not use them for any other work except training purposes?

Col. ARNOLD. No, sir; not at this school.

Mr. BORLAND. These hydroplanes or seaplanes would be entirely devoted to coast-artillery work, because that is their purpose.

Col. ARNOLD. That is their purpose; yes, sir.

Mr. BORLAND. Are they similar to the planes used by the Navy?

Col. ARNOLD. Yes, sir.

Mr. BORLAND. Are they of the same design and construction?

Col. ARNOLD. Practically. There may be some minor changes; we may have one model and they have another model, but the general type is the same.

Mr. BORLAND. How many of these seaplanes have you now?

Col. ARNOLD. We have not increased the number any since that time. We had more than that at Essington, Pa., on the Delaware River.

Mr. BORLAND. How many did you have there?

Col. ARNOLD. We had a total up there of about 14; in addition to that, we had about 6 at San Diego, Cal.

LAND AND BUILDINGS AVAILABLE FOR ACCOMMODATION OF AERIAL MACHINES IN COAST DEFENSES, UNITED STATES AND PANAMA CANAL.

Mr. BORLAND. Colonel, in the fortification bill of 1918 there was included a clause directing the Secretary of War to submit to Congress on or before January 1, 1918, a detailed statement of the land, buildings, and other facilities now available and to be required for the accommodation of airships and other aerial machines to be used in connection with the seacoast defenses of the continental United States, the insular possessions, and the Panama Canal. In response to that direction, the Secretary of War has submitted to Congress House Document No. 725, dated December 29, 1917, in which the Secretary states:

> As estimates for the establishment of these stations are included in the aviation estimates pending before Congress, all the information called for above will be disclosed to congressional committees in confidential hearings to be held during the present session. In view of this, it is recommended that Congress be informed that the submission at the present time of the information called for is deemed incompatible with the public interests, but that in lieu thereof this information will be disclosed confidentially to congressional committees during the present session of Congress.

UNEXPENDED BALANCE.

(See p. 178.)

Now, Colonel, I asked you to get for the committee a statement of the amount of the appropriation made in the fortification bill of 1918 which was expended prior to the 1st day of July, 1917. Please state what that amount was.

Col. ARNOLD. The total amount expended was $781,193.09. That is the total obligated up to and including April 30, 1918.

Mr. BORLAND. Now, that will leave unexpended and unobligated $2,818,806.91; is that correct?

Col. ARNOLD. Yes, sir.

Mr. BORLAND. My impression from what you said this morning in reference to the recent order of the Secretary of War was that that $2,818,000 would not be spent.

Col. ARNOLD. It will not all be spent.

Mr. BORLAND. And no effort will be made to incur any obligations on account of it?

Col. ARNOLD. I can not say that certain small portions of it will not be spent, but the greater part of it will not be spent. There may be small purchases in the future the same as we have made in the past. For instance, we have at the present time a balloon squadron doing seacoast work at Hampton, Va., and we are making small purchases for that squadron all the time.

Mr. **Borland.** Colonel, nothing was acquired for the purpose of coast defense, in the way of aviation, prior to this appropriation of February 14, 1917, was there?

Col. **Arnold.** Not in the continental United States; no, sir.

AVIATION FOR COAST DEFENSE IN PHILIPPINE ISLANDS.

Mr. **Borland.** Was any acquired in the insular possessions?

Col. **Arnold.** Before that time we had one squadron in the Philippine Islands.

Mr. **Borland.** Out of what appropriation was that acquired?

Col. **Arnold.** That was acquired out of the regular aviation appropriation.

Mr. **Borland.** In what bill?

Col. **Arnold.** The Regular Army appropriation bill for the fiscal year ending 1917.

AVIATION FOR COAST DEFENSE, UNITED STATES.

ESTABLISHMENT OF SCHOOL AT ESSINGTON, PA.

(See pp. 178, 181, 185.)

Mr. **Borland.** Immediately upon this appropriation of $3,600,000 in the fortification bill becoming available, your department proceeded to carry out its program of providing a certain number of aerial squadrons for continental United States, did it not?

Col. **Arnold.** The first step taken was the establishment of an aviation school for training coast-defense pilots. This school was established at Essington, Pa., on April 1, 1917.

Mr. **Borland.** Is that school still in existence?

Col. **Arnold.** That school was closed on October 27, 1917.

Mr. **Borland.** What men were sent to that school?

Col. **Arnold.** The school started with a small number of candidates, who were obtained from civil life, taken in for the purpose of training them in the use of sea planes. Up to the time it closed it had only graduated, however, a total of 25. These men have since been diverted for use overseas.

Mr. **Borland.** And none of them is now employed in the coast defenses?

Col. **Arnold.** No, sir.

Mr. **Borland.** What class of machines did they use?

Col. **Arnold.** We had on April 1 at Essington two flying boats and one seaplane; on June 1, 2 flying boats and 12 seaplanes, and we kept that number up, sometimes there would be more than that and sometimes less than that, until the school was abandoned on October 27.

AVIATION SCHOOL AT LAKE CHARLES, LA.

At this date all of those machines have been sent down to Lake Charles.

Mr. **Borland.** What else was done under the appropriation following the act of February 14, 1917?

Col. **Arnold.** Do you want an itemized list of expenditures, sir?

Mr. **Borland.** Yes; if you have it in that form. But I suppose you can tell us how many planes were built and where they were sent.

Col. **Arnold.** The itemized expenditures under that appropriation are as follows: Construction of warehouse at Essington, $20,000; purchases for the balloon school at Hampton, Va., $10,000; purchases of hydrogen cylinders for balloon school, $114,750; aviation equipment and supplies for Essington, $15,000 (that includes one seaplane); construction, Hampton, Va., $297,000.

Mr. **Borland.** Does that include any seaplanes?

Col. **Arnold.** No, sir; that is purely construction. Miscellaneous expenses, $10,000; allotment to Quartermaster General for hydrogen generating outfit, $26,892.50; demountable balloon house, $12,975; forged bronze valves, $11,750; construction, Hampton, Va., $112,000; hangars, Essington, Pa., $10,000; airplane engines, $20,000; payment of civilian employees, Essington, Pa., $22,000; incidental, Aviation School, Essington, Pa., $20,000; experimental work, $2,500; gasoline supply system, $4,054.50; trucks for balloon company, $54,400; gear shape and equipment, $3,852; hydrogen cylinders, $8,900; miscellaneous expenditures, $5,109.09, making a total of $781,193.09.

BALLOON SCHOOL AT HAMPTON, VA.

(See pp. 184, 185.)

Mr. **Borland.** When was this balloon school at Hampton, Va., established?

Col. **Arnold.** I have not the exact date, but some time in March of this year.

Mr. **Borland.** Is it still running?

Col. **Arnold.** Yes, sir.

Mr. **Borland.** What is the purpose of that balloon school?

Col. **Arnold.** It is to train balloon observers for cooperation with heavy guns of the Coast Artillery. Some of these observers probably will be used with the heavy gun regiments on the other side, but at the present time they are all actively engaged in observation of Coast Artillery fire.

Mr. **Borland.** How many men are trained at that school and what is its capacity?

Col. **Arnold.** I have not the exact figures, but somewhere between 75 and 100 when running full capacity.

Mr. **Borland.** From what sources are these men drawn?

Col. **Arnold.** At the present time they are being drawn from the regiments of Artillery, Cavalry, and Infantry.

Mr. **Borland.** Are any of them drawn from the Coast Artillery?

Col. **Arnold.** The majority of the Coast Artillery, as I understand it, have been transferred into regiments of Heavy Artillery, and we do get observers from those regiments.

Mr. **Borland.** After these men are drawn from the various arms of the service and are trained in this balloon observation, are they then attached in any permanent force to the Coast Artillery or do they return to their respective commands?

Col. **Arnold.** Some of them have gone overseas with balloon companies, some of them are still on duty at the balloon school, and others have been returned to the commands from which they originated.

Mr. **Borland.** Then, this school is not wholly devoted to training observers for the Coast Artillery?

Col. **Arnold.** No, sir; it is not.

Mr. **Borland.** Are all the expenses of this school charged against this particular appropriation?

Col. **Arnold.** I am unable to answer that question.

Maj. **Brown.** So far as I know, yes; but I only have the evidence of that statement there.

Col. **Arnold.** I do not believe so, because they have not here the cost of a single balloon for down there or the cost of any of the winch wagons or any of the hangars.

Mr. **Borland.** Who is in charge of that balloon school?

Col. **Arnold.** The balloon school is under the direction of Col. Ferguson, of the Coast Artillery.

Mr. **Borland.** Are any civilians admitted to the balloon school?

Col. **Arnold.** If they are admitted, they are not civilians by the time they get there. They are entered as candidates for observers and put through a preliminary school. After going through the preliminary school at Fort Omaha or Fort Sill they are commissioned and then sent to the school at Fort Monroe.

Mr. **Borland.** So when they reach the balloon school at Fort Monroe they are not civilians, but commissioned officers?

Col. **Arnold.** Yes, sir.

Mr. **Borland.** So, then, the answer would be that no civilians are admitted to the balloon school?

Col. **Arnold.** That is correct.

Mr. **Borland.** Are any enlisted men trained there?

Col. **Arnold.** We train enlisted men to operate the balloons.

Mr. **Borland.** What facilities are provided at the balloon school at Hampton?

Col. **Arnold.** At the present time it is temporary construction entirely. The men and officers both live in tents. However, steps are being taken to put up some kind of semipermanent buildings.

BALLOON SCHOOL AT OMAHA, NEBR.

Mr. **Borland.** You spoke of preliminary work being done at the balloon school at Omaha. Is any portion of your funds devoted to that balloon school at Omaha?

Col. **Arnold.** Any portion of this particular fund, sir?

Mr. **Borland.** Yes.

Col. **Arnold.** The records will show that a certain proportion of these funds was utilized at Fort Omaha for the purchase of the material necessary to produce hydrogen. All the hydrogen for all the balloon work in the United States at the present time is produced at Fort Omaha, compressed into the cylinders at that place, and then shipped to the location of the school at which it will be used.

Mr. **Borland.** Does that mean that the hydrogen used at the school at Hampton, Va., was brought from the school at Fort Omaha?

Col. **Arnold.** Yes, sir.

Mr. **Borland.** And that was the expense that was paid at Omaha?

Col. **Arnold.** Yes, sir.

Mr. BORLAND. Any other portion of your funds used at Omaha?

Col. ARNOLD. No, sir.

Mr. BORLAND. In speaking of the work done at Omaha as preliminary, do you mean the students at Hampton must come from Omaha or must first have taken a course there?

Col. ARNOLD. The majority of them do take a course at Omaha before going to Hampton. I understand, however, that a few have taken the preliminary course at either Fort Sill or San Antonio.

Mr. BORLAND. What preliminary course is given at Fort Sill and San Antonio?

Col. ARNOLD. The same as at Fort Omaha; that is, a man is given sufficient instruction to understand the method of raising and lowering the balloon. He is given a few trips up in the air to become accustomed to the swaying motion of the balloon, so that when he does go up to observe the artillery fire he will not become seasick.

Mr. BORLAND. Then his actual instruction in the work of observation is done at Hampton?

Col. ARNOLD. He receives instruction in puff targets at Fort Sill, Fort Omaha, and Fort Antonio, and at Fort Sill he also observes light artillery. All heavy artillery observation is done at Hampton, Va.

BALLOON SCHOOL AT HAMPTON, VA.

(See pp. 182, 185.)

Mr. BORLAND. Did I understand you to say the graduates of this school at Hampton, Va., had so far been sent abroad for field work?

Col. ARNOLD. Some of them.

Mr. BORLAND. What has become of the rest of them?

Col. ARNOLD. Some others are still on duty at the balloon school at Hampton.

Mr. BORLAND. Graduates?

Col. ARNOLD. Yes, sir.

Mr. BORLAND. In what capacity?

Col. ARNOLD. Instructors.

Mr. BORLAND. Then, except for those retained there as instructors, the rest of the graduates have gone abroad?

Col. ARNOLD. There may be some others who have been returned to their proper organizations.

Mr. BORLAND. Are any of them used in Coast Artillery work?

Col. ARNOLD. I should say not, for the reason that this is the only balloon in the United States which is operating with coast artillery.

BALLOONS PROVIDED OUT OF AVIATION APPROPRIATION ACT JUNE 24, 1917.

Mr. BORLAND. How many balloons were provided for out of these funds?

Col. ARNOLD. The records show that no balloons have been provided out of these funds.

Mr. BORLAND. The balloons you have, then, were provided out of some other funds?

Col. ARNOLD. They were provided out of the appropriation of $640,000,000 of June 24, 1917.

Mr. BORLAND. These various aviation appropriations have been so general in their language that it seems they have all been consolidated and run together in one big program which makes it extremely difficult for us to analyze any portion of it alone.

Col. **Arnold.** Yes, sir; and it was for that reason that at the request of the air service all aviation items would be eliminated from all bills except the Army appropriation bill this year.

Mr. **Borland.** And then the total program can be taken up under that one appropriation in the Army bill?

Col. **Arnold.** Yes, sir.

AVIATION SCHOOLS AT ESSINGTON, PA.—LAKE CHARLES.

(See p. 181.)

Mr. **Borland.** I understood you to say that all of these expenses except $24,000 were incurred prior to July 1, 1917.

Maj. **Brown.** All except $20,226, up to May 9.

Mr. **Borland.** What was that for?

Col. **Arnold.** That was to pay for the incidental expenses on closing up the aviation school at Essington, Pa. The funds were transferred to the disbursing officer at Lake Charles on account of the fact that the entire school at Essington was transferred there.

Mr. **Borland.** What have you now at Lake Charles?

Col. **Arnold.** We have at Lake Charles an advance training flying school.

Mr. **Borland.** Does that school train in the use of sea planes and hydroplanes as well as land planes?

Col. **Arnold.** Yes, sir; we have a limited number of sea planes at that station. The majority of the work, however, is done with land planes.

Mr. **Borland.** There is where you spoke of having provided in all about sea planes?

Col. **Arnold.** Yes, sir; we have eight seaplanes and two flying boats at that place.

Mr. **Borland.** Is any portion of this fund devoted to the keeping up of the school at Lake Charles?

Col. **Arnold.** No, sir.

Mr. **Borland.** Out of what fund is that kept up?

Col. **Arnold.** That is kept up out of the fund appropriated in July of last year for the increase in the Signal Corps—the $640,000,000 appropriation.

CONSTRUCTION AT HAMPTON, VA.

(See pp. 182, 184.)

Mr. **Borland.** The largest single item of expense you have in the list which you have submitted is for construction at Hampton, Va., $297,000. What was constructed with that sum?

Col. **Arnold.** It was probably a hangar for the balloon. These hangars are necessarily very large, due to the fact that they do not deflate the balloons at night, but carry them in inflated. It costs about $750,000 to construct a balloon station, the buildings alone.

CONTROL OF AVIATION TRANSFERRED TO DIVISION OF MILITARY AERONAUTICS.

Mr. **Borland.** I believe you said that the control of aviation had been transferred from your department to whom?

Col. ARNOLD. Gen. Saltzman stated this morning that the control of aviation had been transferred from the Chief Signal Officer to the chief of the Division of Military Aeronautics, who is Gen. Kenly, and I am assistant to Gen. Kenly.

Mr. BORLAND. And that department is called?

Col. ARNOLD. The Division of Military Aeronautics.

Mr. BORLAND. What jurisdiction is embraced under that Division of Military Aeronautics?

Col. ARNOLD. The exact duties of the division of military aeronautics have not as yet been defined. At the present time it is performing the duties which were formerly performed by the air division of the Signal Corps, which consisted of securing, training, organizing, and equipping all air-service personnel.

Mr. BORLAND. And therefore it becomes your duty to take over all of these schools, airplane training grounds, balloon schools, and conduct them under that new department?

Col. ARNOLD. Yes, sir.

ESTIMATES SUBMITTED TO MILITARY AFFAIRS COMMITTEE OF THE HOUSE FOR SEACOAST DEFENSES.

Mr. BORLAND. And that department has submitted the estimates for its entire air program under the Army bill of this year?

Col. ARNOLD. Yes, sir.

Mr. BORLAND. That is where it wants to take them up?

Col. ARNOLD. It has already taken them up.

Mr. BORLAND. It is not intended by that department to devote any of its work to the seacoast defenses?

Col. ARNOLD. In our new bill?

Mr. BORLAND. Yes.

Col. ARNOLD. Our estimates for the year 1918-19, as submitted to the Military Affairs Committee of the House, called for seaplanes for coast-defense squadrons in the United States; it provides the equipment for 16 coast-defense squadrons; the equipment and instruments for those planes will come out of the special allotment for aeronautical instruments, machine guns, photographic equipment and supplies, and radio apparatus, as requested in that same bill.

Mr. BORLAND. You are estimating, as I understand it, in your general estimate, as already submitted to the Military Affairs Committee, for seaplanes for the coast defenses, which will comprise 16 coast-defense squadrons.

Col. ARNOLD. Yes, sir.

Mr. BORLAND. And you are estimating in that same set of estimates for the equipment of those seaplanes?

Col. ARNOLD. Yes, sir.

Mr. BORLAND. In the way of machine guns and so on?

Col. ARNOLD. Yes, sir.

Mr. BORLAND. What is the intention with regard to the use of those seaplanes? Where are you going to use them if the committee gives them to you and if you are able to get them?

Col. ARNOLD. In the same bill we have estimated for the construction of 6 permanent coast-defense stations and 20 permanent balloon coast stations.

Mr. **Borland**. I wish you would add to each one of those items the amounts, if they are separated in that way. What is the amount for the seacoast seaplanes?

Col. **Arnold**. That is not carried separately. We estimated a total of $668,000,000 for seaplanes and engines.

Mr. **Borland**. For seacoast purposes?

Col. **Arnold**. That is the total for all aviation purposes.

Mr. **Borland**. The items are not separated?

Col. **Arnold**. Not as to costs; no.

Mr. **Good**. Has any order been given for the assignment of these squadrons to the coast defenses?

Col. **Arnold**. There has been an order issued giving the general location of each squadron. At the present time, however, the squadrons have not been organized for this purpose, because it is considered more urgent that they go overseas.

Mr. **Good**. Last year it was proposed to organize 6 squadrons of 12 planes each under the appropriations which Congress granted. Have those squadrons been organized for the seacoast defenses?

Col. **Arnold**. They were probably organized but were not used for the seacoast work.

Mr. **Good**. Why?

Col. **Arnold**. Because the Secretary of War considered it more urgent that they be trained as land squadrons and sent overseas.

Mr. **Good**. Is it considered now that it is necessary to organize these squadrons for the seacoast defenses and go to the expense of buying these planes during the present emergency?

Col. **Arnold**. No, sir; not at the present time; but the military conditions may change at any time to such an extent that it will be imperative that we establish seacoast squadrons and change some of our land squadrons into seacoast squadrons.

Mr. **Good**. And therefore you are asking in the military bill for money with which to establish 16 squadrons?

Col. **Arnold**. Yes, sir.

Mr. **Good**. That will involve the purchase of land?

Col. **Arnold**. The land may or may not be purchased; the probabilities are that it will be leased, because at this time we are leasing all of the land. We have only made one purchase, and that was from money especially appropriated by Congress for the purpose of purchasing land.

Mr. **Good**. If I recall, Gen. Squier last year gave us this information: That 96 machines had been ordered under specifications for the coast defense, of which 16 were going to the Curtiss Co., at $22,500 each: 32 to the Standard Aeroplane Co., at $21,000 each; 32 to the Burgess Co., at $21,422 each; and 16 to the Aero Marine Co., at $18,000 each. Were those machines all completed?

Col. **Arnold**. No, sir; there were none completed. Before they actually started on operations to produce those machines the conditions changed and they were given orders for land machines instead. As I remember it now, each one of those companies produced one machine under that order and then the order was canceled.

Mr. **Good**. And it is not now intended to employ any fund for the purchase of these seaplanes during the present emergency unless the conditions change.

Col. ARNOLD. No, sir; if the time comes when we make more machines in the States than they can utilize overseas we may establish the seacoast stations as training stations. In other words, the seacoast stations will be established so we will have them, but we will use them as training schools through which our pilots will pass before they are sent overseas.

Mr. GOOD. If it is not intended to use any funds for the purchase of squadrons to be assigned to seacoast defenses during the present emergency, unless conditions shall change, with the probabilitiy of Congress being in session practically all the time, what is the necessity for urging an appropriation of $16,000,000 for that purpose in the other committee?

Col. ARNOLD. The Secretary of War explained that before the other committee by saying you can never tell to-day what is going to happen to-morrow; he said he deemed it advisable to appropriate that money because we never knew what was going to happen. We may want to establish those stations to-morrow, and we may need them to-morrow.

Mr. GOOD. It will take some time to secure the planes, will it not?

Col. ARNOLD. The type of planes which we will probably use for the seacoast stations could be gotten out for the 16 squadrons at the rate of about 20 a week. That would be a squadron a week.

Mr. GOOD. Then, if I understand you, we now have four of these seaplanes for coast-defense work?

Col. ARNOLD. I do not know where you got the figure 4.

Mr. GOOD. Well, I mentioned the Curtiss Co., the Standard Airplane Co., the Burgess Co., and the Aero Marine Co.

Col. ARNOLD. I see what you mean. * * *

Mr. GOOD. Then you have acquired planes for seacoast defense other than those mentioned by Gen. Squier in his testimony of last year?

Col. ARNOLD. Yes, sir.

Mr. GOOD. Those have been acquired since?

Col. ARNOLD. Yes, sir.

Mr. GOOD. Are they of the same general type?

Col. ARNOLD. No, sir.

Mr. GOOD. What is the difference?

Col. ARNOLD. They have single motors instead of double motors.

Mr. GOOD. They are smaller planes?

Col. ARNOLD. Very much smaller; yes, sir.

Mr. GOOD. Are they considered as suitable for seacoast defense as the larger plane?

Col. ARNOLD. They are more suitable for our purpose, due to the fact that the twin-motored machine in the United States has been purely experimental and has never been developed beyond that stage.

Mr. GOOD. Now, from what fund are you asking for an appropriation for the maintenance of these coast-defense planes that you now have?

Col. ARNOLD. These machines are being maintained at the present time under the $640,000,000 appropriation, and also under the aviation seacoast defense appropriation act, February 14, 1917, for

Hawaii, and aviation coast defense act No. 21 for Panama Canal, June 12, 1917.

Mr. Good. Why have they not been maintained under the appropriation of $3,600,000 granted in this bill? They are purely seacoast defense items.

Col. Arnold. I am unable to answer that question, sir.

Friday, May 17, 1918.

FIRE-CONTROL INSTALLATION.

(See p. 31.)

Col. Hase. Mr. Chairman, you asked Gen. Barrette the other day to submit a statement showing our fire-control projects in which 16-inch guns and the guns which were listed for withdrawal for service abroad have been considered. Yesterday we tried to work out such a statement, and we ran into considerable difficulty because of the fact that the work at some of the coast defenses had proceeded, and it was very hard to separate out the work that was contemplated for the batteries which will remain and the work which was contemplated for those batteries which have been taken away. Therefore the general had me draw up a statement, and I thought possibly rather than insert it in the record in its proper place it would be better for me to read it, because possibly there might be some questions by the committee about it. [Reading:]

When the hearings on the urgent deficiency bill approved June 15, 1917, were held a standard fire-control system had been installed in seven coast-defense commands on the Atlantic coast and three on the Pacific coast. Between Fort Caswell, N. C., and Galveston, Tex., where no standard fire-control system had been established, there were 31 major, 10 intermediate, and 26 minor caliber batteries; and between Portland, Me., and Fort Caswell, where no standard fire-control installation system had been established, there were 27 major, 16 intermediate, and 28 minor caliber batteries. On the Pacific coast there were 25 intermediate and 18 minor caliber batteries for which no standard system had been installed.

The total number of major-caliber batteries, not including 16-inch guns or 16-inch mortars, was 58; intermediate-caliber batteries, 51; and minor-caliber batteries, 74. In submitting estimates to Congress prior to that time the unit costs which had been used for the installations were as follows: $25,000 for 8-inch batteries and above, $4,000 for 5 and 6 inch batteries, and $3 200 for the batteries below 5-inch. These amounts include the Ordnance Engineer, and Signal Corps work and material; they include equipment for the plotting room, battery-commanders' stations, base-end stations, all construction work pertaining to these stations, purchasing telephones and communicating lines, and the cost of installation. Included, also, in the unit cost per battery is the proportionate amount for fire and fort commanders' stations, meteorological stations, tide stations, and fire-control switchboard rooms. The ordnance equipment for all of the batteries had been provided for in past appropriations, but the high cost of Signal Corps and engineer materials will offset the cost of this ordnance material.

Even in those coast-defense commands where a standard fire-control system had been established no provision had been made for the equipment necessary for the batteries below 8-inch. This was due to the fact that at the time these standard installations were made it had not been definitely determined what the fire-control system for these batteries should be.

Studies had been made in the fall of 1916 based upon installing coincident range finders at all of the minor caliber vatteries and also at those intermediate caliber batteries where the height of site was less than 100 feet. At those batteries where the height of site more that 100 feet, a depression position finder was contemplated. These studies had been received and were under consideration when the United States entered the war. A complete study had also been made in all coast defense commands where no standard system had also been installed and a comprehensive plan was in progress to provide all of the batteries with a complete installation. Our entrance into the war upset these plans because of the fact that a great many seacoast guns were withdrawn for service abroad. The studies which had been received were returned for revision with instructions to provide an installation for those batteries which were to remain within the fortifications.

It would not be proper to withdraw funds equal to the unit cost per battery times the number of batteries withdrawn, because in each unit's cost there is a proportionate part of the accessory stations which go with each fort command irrespective of whether it contains 2 or 10 patteries. It would be more reasonable to allow the funds to remain in hand, at least until next year, because by that time it will be known definitely how much can be withdrawn.

The old provisional installations provided overhead lines of communication which have now been in position for periods of over 15 years. These lines are going to pieces and the wooden buildings housing the instruments are decaying, and some work must be done in order that the batteries now installed may be ready for action. When these provisioal installations were installed the communication system provided only for those batteries which were actually manned. The strength of the Coast Artillery at that time was approximately one-tenth of what it now is. All batteries are manned at the present time, and in order that efficient training might take place, there must be facilities for communicating between the battery commanders and the fire and fort commanders.

The work in some of the coast defense commands is in progress at the present time and much time and funds would be lost if the work were stopped now and not carried to completion.

It is urgently recommended, therefore, that the funds appropriated for in the act of June 15, be retained until the hearings next year when more definite information can be furnished as to what has been accomplished.

Among the items carried in the estimates underlying the $3,147,225 appropriation is one for the fire control installation for the Cape Henry project.

Since no work is to be done on this project this year, it is believed that the $158,000 should be withdrawn.

Mr. BORLAND. That is $158,000 of the $3,147,225, which you think should be withdrawn?

Col. HASE. Yes, sir; that was one of the items that entered into the estimate.

Mr. BORLAND. Do I understand, then, that you think all of the $1,726,000 balance on hand unallotted should be retained except this $158,000?

Col. HASE. Yes, sir. If we are allowed to retain that money I am certain that we would never again come to the committee and ask for funds for fire-control stations or equipment for any of the batteries we have now, because we have enough money to complete the work, provided no radical changes are made in the fundamental principles which now govern these installations. I believe we will have a balance left next year which we can turn back; but it is very hard to arrive at any definite figure at this time because of the fact, as stated in this paper, a certain part of the installation must take place in the coast-defense command, whether there is one battery or twenty batteries in that coast-defense command. That is on account of the superior commander stations which have got to be constructed and the communicating cables from that superior commander out to the fire commander, mine commander, and to the batteries. The number of guns to be withdrawn is very uncertain because Gen. Pershing's requirements are changing.

Mr. BORLAND. Of course, it all gets down to the proposition of whether we want to spend time, money, labor, and material on coast fortifications instead of speeding up our work in other directions.

Col. HASE. Yes, sir; but this work in the coast defenses can go on, because the installation in the old fortifications in done by our electrical specialists. We ask the Engineer Department to construct the stations and the Signal Corps to supply the material. We are then able with our own men to go ahead and make the installation.

Mr. BORLAND. I am glad to have the statement, but I did have in mind that a large amount of that unallotted balance would not be and could not be used during the coming fiscal year.

Col. HASE. I do not believe we could bring in a comprehensive statement which would show the actual conditions. It would be almost impossible to separate it out.

Mr. BORLAND. I know, of course, that there is no use providing fire-control stations at Cape Henry when there is not a single gun in place except those temporary guns.

Col. HASE. No, sir; but last June or April, when these estimates were made, the engineers at that time were contemplating going right ahead with the minor caliber batteries, the 6-inch batteries. There are four 6-inch guns in that project, and if we were going to put in the installation to make the fire of those 6-inch batteries effective, we would have to put in an installation which contemplated its future expansion; that is, the cables, instead of being, say, 4 pair, should be perhaps 20-pair cables in order to provide for the future expansion, which would save money in the end.

Mr. BORLAND. Yes, but you are not going to do any work at Cape Henry.

Col. HASE. No, sir; and therefore that $158,000 item can be withdrawn.

SATURDAY, MAY 18, 1918.

STATEMENTS OF GEN. T. C. DICKSON, CHIEF OF CONTROL BUREAU, ORDNANCE DEPARTMENT, AND COL. JOHN R. SIMPSON.

ORGANIZATION OF BUREAU OF ORDNANCE.

(See p. 168.)

Mr. BORLAND. General, you are the Chief of the Control Bureau of the Ordnance Department?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. The Ordnance Department is now divided into the Control Bureau, the Engineering Division, the Procurement Division, the Production Division, and the Inspection Division?

Gen. DICKSON. The Supply Division and the General Administration Bureau.

Mr. BORLAND. What are the functions of the Control Bureau? What is the jurisdiction of that bureau?

Gen. DICKSON. It receives the programs showing the rate at which men are called into service and sent abroad; it receives the approved organizations from the Chief of Staff; it also receives from the Chief of Staff the approved articles to be issued, and, based on them, prepares schedules of requirements for the items the Ordnance Department is to supply, showing the quantity to be produced in successive months for the period that the man program covers. It prepares the estimates for the Congress, and, when funds are available, it issues the schedules of requirements, with a procurement request reserving the necessary funds; it also follows production and keeps the Chief of Ordnance and, through him, the War Department informed as to the progress made. It also has the coordinating function of keeping the other divisions operating within their functions and assists them in any way it can. It has been handling matters relating to labor, construction of new plants, and planning for the future.

Mr. Borland. The committee will want to examine into the expenditure of the appropriations which have been made since 1917 in some detail, and they want to go, in some detail, into the proposed new estimates when we reach that point. I want to ask you, first, at this point about this: You have recently, within the last few weeks, prepared practically an entirely new set of estimates for Field Artillery and Field Artillery ammunition, have you not?

Gen. Dickson. Yes, sir.

Mr. Borland. Those estimates have left your office, have they?

Gen. Dickson. Yes, sir.

Mr. Borland. And were complete, so far as you were concerned?

Gen. Dickson. Yes, sir.

Mr. Borland. Then, General, you may go ahead and complete your statement about the functions of these various bureaus of the Ordnance Department. Explain to the committee what the other bureaus are and what they do.

Gen. Dickson. The Engineering Bureau determines and fixes types, either through drawings or by the adoption of a model, for all articles supplied by the Ordnance Department, and conducts any experimentation necessary to the development for putting into production all ordnance. The General Administration Bureau has charge of the personnel, the accountability for all ordnance property. It keeps the financial records of the Ordnance Department, has charge of the training of the commissioned and enlisted personnel, and prepares general legislation for submission to Congress. The Procurement Division starts with the procurement requests and schedule of requirements and conducts all negotiations until terminated with a purchase order and the execution of a contract. The Production Division is charged with the responsibility of securing the completion of the material contracted for in accordance with the orders and contracts. It has a corps of experts which assists contractors in every way possible. The Inspection Division passes upon all articles when they are completed and determines that the quality is in accordance with the contract. When matériel is accepted it is turned into the possession of the Supply Division, which is charged with warehousing, the getting of the articles to and into the hands of troops. We also have what is known as the Nitrate Division, which is in charge of the construction of nitrate plants.

Mr. Borland. Is that a nitrate division or is that a nitrate supply committee?

Gen. Dickson. It is a nitrate division in the office of the Chief of Ordnance.

Mr. Borland. The nitrate supply committee, which was organized under the national-defense act, was composed of Government officials from the Ordnance Department, from the Ordnance Department of the Navy, and from the Bureau of Mines, was it not?

Gen. **Dickson**. Yes, sir.

Mr. **Borland**. What has become of that committee?

Gen. **Dickson**. That committee is performing its functions, sir, but the part that is performed by the Ordnance Department is in this nitrate division.

Mr. **Borland**. Who is at the head of the Nitrate Division?

Gen. **Dickson**. Col. Joyes.

Mr. **Borland**. Who is at the head of the Production Division?

Gen. **Dickson**. Col. Tripp; Col. Ruggles is at the head of the Inspection Division, and Col. Ames of the Supply Division.

Mr. **Borland**. I suggested a few minutes ago that you had in the last few weeks prepared new and enlarged estimates that have practically doubled your program of field artillery, as contemplated at the time the original estimates came in.

Those estimates were completed so far as your department was concerned, and have left your department and gone to the General Staff. It so happens that they have not yet reached the committee, but it being so close to the end of the fiscal year and there being a possibility that Congress will adjourn, it is necessary for us to proceed now with the hearings on those estimates in the condition which they left your department, assuming that they will reach the committee in that shape. I wanted to ask you this morning to explain to the committee the basis of those new and enlarged estimates, how many men they involved, the program for those men, the character of the guns, and your policy in procuring that supply. In doing that, if you do not want it in the record, we can dispense with the record altogether, but we want to give you an opportunity to make a general statement opening up this whole question.

Gen. **Dickson**. I think, perhaps, it would be well to leave this out of the record.

Summary of fortifications estimates submitted and proposed to be submitted for the fiscal year ending June 30, 1918.[1]

	Original, October, 1917.		Deficiency, Mar. 8, 1918.	Supplemental, April, 1918.	
	New items.	Cash for previous contract authorized.		New items.	Cash for previous contract authorized.
rmament of fortifications, B		$225,000,000	$84,061,000	$887,912,295	
rmament of fortifications, C	$1,474,317,250	777,182,750	272,500,000	1,865,329,550	$80,725,000
Armament of fortifications, H	885,000	3,000,000			
Armament of fortifications, K	1,700,000				
Armament of fortifications, L	189,164,250	50,000,000	18,513,465	234,211,182	
Armament of fortifications, N	51,600,000			38,920,275	33,100,000
Aberdeen Proving Ground			7,700,000		
Sandy Hook Proving Ground	1,008,522				
Submarine mines (purchase)	26,000				
Submarine mines (matériel)	100,000				
Fortifications, I. P., H	225,000	2,550,000			
Submarine mines, I. P. (maintenance)	36,575				
Armament of fortifications P.C., H	120,000	700,000			
General contract authorization				500,000,000	
	1,719,062,597	1,058,432,750	382,774,465	3,526,373,302	113,825,000

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[1] As corrected in hearings.

Summary of fortifications estimates submitted and proposed to be submitt for the fiscal year ending June 30, 1918—Continued.

	Supplemental to be submitted.	Total.	Total estimates.		
			Total cash.	Total contract authorized.	Total.
Armament of fortifications, B.	$36,055,000	$1,233,028,295	$725,990,675	$507,037,620	$1,233,02
Armament of fortifications, C.	27,180,000	4,497,234,550	2,967,887,000	1,529,347,550	4,497,234
Armament of fortifications, H.	....	3,885,000	3,885,000	....	3,88
Armament of fortifications, K.	....	1,700,000	1,700,000	....	1,70
Armament of fortifications, L.	....	491,888,897	324,164,250	167,724,647	491,8
Armament of fortifications, N.	....	123,520,275	123,520,275	....	123,52
Aberdeen Proving Ground....	....	7,700,000	7,700,000	....	7,70
Sandy Hook Proving Ground.	....	1,008,552	1,008,522	....	1,00
Submarine mines (purchase)..	....	26,000	26,000	....	26
Submarine mines (matériel)..	....	100,000	100,000	....	10
Fortifications, I. P., H.......	....	2,775,000	2,775,000	....	2,775,0
Submarine mines, I. P. (maintenance)........	....	36,575	36,575	....	36,5
Armament of fortifications P. C., H........	....	820,000	820,000	....	820,0
General contract authorization........	....	500,000,000	....	500,000,000	500,000,
	63,235,000	6,863,723,114	4,159,613,297	2,704,109,817	6,863,723,11

PURCHASE, MANUFACTURE, AND TEST OF MOUNTAIN, FIELD, AND SIEGE CANNON.

MONDAY, *May 20, 1918.*

Mr. BORLAND. General, the committee will want to inquire in detail into the expenditure of the appropriations which have been made since 1917 for purchase, manufacture, and test of mountain, field, and siege cannon; but my understanding is that under the organization of the bureaus of the Ordnance Department the making of the contracts falls more particularly under the procurement division, and the fulfilling of the contracts falls under the production division, and therefore it would probably be better to call the heads of those divisions as to the contracts which have been entered into and the deliveries which have been made under those contracts.

Gen. DICKSON. Yes, sir.

Mr. BORLAND. General, I notice in the estimates which have now reached the committee that you ask for $225,000,000 under this item; and I understand you have prepared in the last few weeks a new set of estimates on this subject. I wish you would state to the committee what the new estimates are and whether they are supplemental or whether they are a substitute for the entire item.

Gen. DICKSON. A supplemental estimate of $1,063,131,119 was prepared and submitted to the War Department to enable the additional mountain, field, and siege cannon to be purchased that is required for three armies, and I have before me an additional supplemental estimate for $34,050,000 to cover additional mortars and railway carriages and service cars therefor, and a plant for the manufacture of the mortars to enable a recent cable request from Gen. Pershing to be filled.

Mr. BORLAND. General, are the two estimate you have given here supplemental to the $225,000,000 estimate?

Gen. DICKSON. Yes, sir; they are in addition.

Mr. BORLAND. So that the total asked for now is the sum of the $225,000,000 estimate, the $1,063,131,119, and the $34,050,000?

Gen. DICKSON. Yes.

Mr. BORLAND. What was the date of the $1,000,000,000 estimate? On what date did it leave your office?

Gen. DICKSON. About April 15.

Mr. BORLAND. What was the date of the $34,000,000 estimate?

Gen. DICKSON. The cablegram asking for that material arrived the latter part of last week, and I have just figured up the cost so as to submit a supplemental estimate for it.

Mr. BORLAND. General, give us the basis of your $225,000,000 estimate? What did you propose to do with that appropriation?

Gen. DICKSON. That sum was provided in the urgent deficiency act approved October 6, 1917, as a contract authorization and an appropriation of that amount is now necessary to enable payments to be made.

GUN BATTERIES AND AMMUNITION COMPANIES.

Mr. BORLAND. What did the previous appropriations provide for?

Gen. DICKSON. Seventy-five millimeter gun batteries, horsed, ——; batteries required, —— provided for; asked for in the supplemental estimate, —— batteries.

Mr. BORLAND. In which supplemental estimate?

Gen. DICKSON. In the supplemental estimate of $1,063,131.119. The following will give you the total—what we had previously had money for—and then exactly what we are asking for now—75-millimeter guns motorized; total, —— batteries; none provided for: supplemental estimate therefor covers —— batteries. One hundred and fifty-five millimeter howitzers; total required, —— batteries; previously provided for, —— batteries; covered by the estimate, —— batteries. One hundred and fifty-five millimeter guns, total required. —— batteries; previously provided, —— batteries; included in the supplemental estimate, —— batteries. Two hundred and forty millimeter howitzers, total required. —— batteries; provided to date. —— batteries; included in supplemental estimate, —— batteries. Four and seven-tenths antiaircraft guns, —— batteries required; previously provided, none; included in supplemental estimate, —— batteries.

Now, ammunition companies: For 75-millimeter gun batteries, horsed, total required, ——; provided to date, ——; covered by the supplemental estimate, —— batteries.

Mr. BORLAND. What do you mean by ammunition companies?

Gen. DICKSON. They are the companies that carry the ammunition.

Mr. BORLAND. They do not have guns, do they?

Gen. DICKSON. We estimate for the gun, carriage, and limber of truck to haul with the battery, and then you have to provide, in a certain ratio, for ammunition trains.

For the 75-millimeter guns——

Mr. BORLAND. You are still talking about ammunition companies?

Gen. DICKSON. Yes, sir; these are all ammunition companies that I am referring to now—75-millimeter truck companies (motored); the total required is ——; provided for on previous appropriattions. ——; covered by the supplemental estimate, ——. Four and seven-tenths-inch gun truck companies; total required. ——; previously provided for, ——; included in the supplemental estimate, ——: 155-millimeter howitzer truck companies, —— required; —— previously provided for; —— covered by the supplemental estimate. Two hundred and forty millimeter truck companies (this includes both 240-millimeter howitzers and 155-millimeter guns), the total required is ——; previously provided for, ——; leaving —— included in the supplemental estimate.

The total estimated cost of the above gun batteries and the ammunition companies is $452,405,916.

Mr. **Borland**. General, does this supply the initial equipment of three armies?

Gen. **Dickson**. This is the initial equipment of three armies, plus 50 per cent for training, and plus 50 per cent for replacement.

Mr. **Borland**. Is that on the basis of allotments to divisions that you showed us on Saturday?

Gen. **Dickson**. Yes, sir; that works out in this way. For instance, you will remember that the initial equipment of a division requires 75-millimeter guns.

Mr. **Borland**. Yes.

Gen. **Dickson**. Now, three times that is ——. You will notice in reading out these tables, the basic number to go directly to three armies is — batteries, which is— or — times the number we had for a division.

Mr. **Borland**. General, I do not see any trench mortars in here.

Gen. **Dickson**. They are under a separate heading.

MOTOR EQUIPMENT FOR BATTERIES.

Mr. **Borland**. What else is included in your $1,063,000,000 estimate?

Gen. **Dickson**. Now, there has been prescribed by the General Staff, motor equipment for various batteries. For the 75-millimeter equipment, you will recall, I stated you had provided —— batteries. We have got to procure the motor equipment that goes with each of those batteries. The motor equipment for a battery consists of one-third of a Nash truck and one-half of a passenger car. For a battery we provide one-third of a truck and one-half of a 7-passenger car and the total cost per battery is $4,170.

Mr. **Borland**. What do you mean by providing one-third of a truck for each battery?

Gen. **Dickson**. In other words, you put three batteries together and for those three they get this Nash truck, and for every two batteries they get this motor car.

Mr. **Borland**. Do you mean to say, then, that the movement of that battery is dependent upon the movement of two other batteries?

Gen. **Dickson**. They gave us a certain number for the Army. Now, in order to get these all down into our common units of battery, we take the number and divide it by the number of batteries.

Mr. **Borland**. Yes; but I do not yet quite understand that. If you have a horse-drawn battery, you have your horses for each gun, with sufficient horses to move it up to its place and then take it away at any time.

Gen. **Dickson**. Yes.

Mr. **Borland.** If you have a motor-drawn battery, do you mean to say the movement of the battery is dependent upon the movement of some other batteries, and that they all have to be moved at the same time or not all all?

Gen. **Dickson.** I did not explain that clearly. When we motorize the battery we provide the necessary trucks for drawing every bit of the vehicles that go with the battery, like the guns, etc. This is equipment for the battalion commander, the intelligence officer, the range-finding party, and people like that that are not attached to a battery, but per battery, or, as they put it, per battalion or per regiment, we furnish so many of these. Now, in order to get it on our basis for estimating, etc., we do what perhaps is not very clear; we find out just what part of a truck and car goes with a battery so as to match up with the number of batteries.

Mr. **Borland.** Where do you figure in the truck which draws the battery?

Gen. **Dickson.** We include that in the equipment. For instance, in the 75-millimeter gun battery, motorized, we include the motors in the cost of their battery.

Mr. **Borland.** What does this motor equipment for the general use of the batteries amount to?

Gen. **Dickson.** For the 75-millimeter batteries it is ——— per battery, or a total of $6,805,440.

Mr. **Borland.** How much is it for the 75-millimeter horse-drawn batteries that you are providing for?

Gen. **Dickson.** It makes no difference whether they are horse drawn or not.

Mr. **Borland.** This motor equipment is supplemental to the horse-drawn equipment?

Gen. **Dickson.** Yes, sir; that is right.

Mr. **Borland.** How many have you provided for the 75-millimeter motorized batteries?

Gen. **Dickson.** None.

Mr. **Borland.** Why not?

Gen. **Dickson.** Because that is included in the items of motor equipment that belong with those batteries.

Mr. **Borland.** Are there any other batteries you have provided this supplemental equipment for?

Gen. **Dickson.** Yes, sir; there are —— 4.7-inch gun batteries.

Mr. **Borland.** Where are they listed?

Gen. **Dickson.** I did not read them a moment ago, because the money has already been appropriated and we do not have to ask you for any more money for the guns, carriages, and caissons for those batteries. You had previously provided for that number, and now the motor equipment must be provided for the —— batteries.

Mr. **Borland.** For —— 4.7-inch guns? How much does that amount to?

Gen. **Dickson.** $17,085,204.

Mr. **Borland.** For only —— batteries?

Gen. **Dickson.** Yes, sir; that includes all the motor equipment for drawing the guns and the ammunition vehicles.

Mr. **Borland.** When you provided for those —— 4.7-inch guns in your previous appropriations you did not provide any equipment for them at all?

Gen. DICKSON. No motor equipment; they were to be horse drawn at that time.

Mr. BORLAND. What has become of the money that you were to use for the horses?

Gen. DICKSON. The most of that has probably been spent in harness.

Mr. BORLAND. But you are not going to use harness.

Gen. DICKSON. We will use that harness for the horses drawing the 75-millimeter guns and also for horse ammunition companies.

Mr. BORLAND. Does not that result in a credit somewhere?

Gen. DICKSON. Yes, sir; that will make a saving, and we are taking that into account.

Mr. BORLAND. We want to identify it so we can take it into account.

Gen. DICKSON. Well, we are taking that into account.

Mr. BORLAND. At any rate these —— 4.7-inch guns were appropriated for on the theory that they were to be horse drawn?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. You have changed that plan and now they are to be motor drawn?

Gen. DICKSON. The General Staff directed it.

Mr. BORLAND. At any rate, the plan has been changed?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. And you are now estimating, in the supplemental estimate, for motor equipment?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. And that ought to leave a credit somewhere of the amount originally included for the horse-drawn equipment.

Gen. DICKSON. We are taking credit. You need not worry about that, and for this reason, that we can not get the harness. You are perfectly safe on that.

Mr. GOOD. Is the 4.7-inch gun the largest gun you propose to buy out of this appropriation?

Gen. DICKSON. No, sir; we are going to buy the 4.7-inch gun; then the 155-millimeter howitzer, the 155-millimeter gun, and the 240-millimeter howitzer.

Mr. GOOD. The 240-millimeter howitzer is the largest gun you will buy out of this appropriation?

Gen. DICKSON. No, sir. Then we go clean up to the 14-inch gun and the 16-inch howitzer.

Mr. GOOD. But you have not given those.

Gen. DICKSON. No, sir; we have not come to them yet. We have taken everything that is supposed to be classed as a mobile gun that is to be issued to the land forces; all mobile artillery comes out of this.

Mr. BORLAND. Give us the next item.

Gen. DICKSON. Motor equipment for — batteries of 155 millimeter howitzers.

Mr. BORLAND. This is the complete motor equipment?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. How much does that amount to?

Gen. DICKSON. That amounts to $64,320,768.

Mr. BORLAND. Where are those — batteries in the list—but they were previously appropriated for, were they not?

Gen. Dickson. Yes, sir; and now we must get the motor equipment for them.

Mr. Borland. In your previous appropriation, what method of transportation was intended?

Gen. Dickson. My recollection is that there was no estimate put in for anything on that, because it was suspected that they would have to be motorized, but the matter had not been decided. The same thing is true of the next item—the 240-millimeter howitzers. There are — batteries of 240-millimeter howitzers. That amounts to $38,724,292. The method of transporting them had not been decided upon.

Mr. Borland. Was any estimate included in the last appropriations for transporting them?

Gen. Dickson. No, sir; not of those last two items.

Mr. Borland. What is the next one?

Gen. Dickson. The total estimated cost of motor equipment amounts to $126,935,704. Since the previous estimates were submitted the number of 75-millimeter antiaircraft guns has been increased by —, and so we have included in this supplemental estimate an item of $603,800 to cover their cost.

Mr. Borland. — guns?

Gen. Dickson. Yes, sir.

Mr. Borland. They do not come in batteries?

Gen. Dickson. They generally do; but this happens to be guns, and for that $603,800 will be required.

Mr. Slemp. What constitutes the motor equipment for one gun?

Gen. Dickson. I have not the details. I have it for the 240-millimeter howitzer, and I can give that to you; but I will telephone down and find out about the other, so that we can put it in the record. For instance, the very next item following that, — 240-millimeter howitzer batteries, is made up as follows——

Mr. Slemp (interposing). What is the total for the —?

Gen. Dickson. $38,724,292. There is two-thirds of a 2½-ton tractor: twenty-four 5-ton tractors——

Mr. Slemp. (interposing). Are you giving the equipment for the —?

Gen. Dickson. For each of the — 240-millimeter howitzers; yes, sir. As I say, there is two-thirds of a 2½-ton tractor; twenty-four 5-ton tractors and eight 4-ton trailers for each battery of four howitzers.

Mr. Slemp. What is the weight of one of those guns—the weight of a 240-millimeter gun?

Gen. Dickson. I do not remember, sir.

Mr. Byrns. What is this motor equipment to which you refer?

Gen. Dickson. It consists of these heavy tractors for pulling——

Mr. Byrns (interposing). I understand, but this is the motor equipment for what, did you say?

Gen. Dickson. For the 240-millimeter howitzer batteries, the 155-millimeter howitzer batteries. A certain percentage of the 75-millimeter batteries are to be horse drawn and all of the rest of the artillery is to be motor-drawn. One of the reasons for that is that it is so expensive to get the horses over there and then it takes a great deal of tonnage to maintain the horses.

Mr. BYRNS. Just how many guns are represented in this equipment that you have just detailed?

Gen. DICKSON. That is for the motor equipment? Of the twenty-four 5-ton tractors I mentioned 4 are used for pulling the pieces.

Mr. SLEMP. That is the reason I asked you for the weight of a gun.

Gen. DICKSON. And then the other 20 are used for the ammunition vehicles.

Mr. BORLAND. Is that the equipment for each gun or for each battery?

Gen. DICKSON. That is for a battery, sir.

Mr. BORLAND. Then the total equipment for a battery is $100,000?

Gen. DICKSON. The motor equipment for a 240-millimeter howitzer battery is $100,322 and the motor equipment for a 155-millimeter howitzer battery is $83,755.

Mr. SLEMP. Then you are paying about $3,000 apiece for those tractors, on an average?

Gen. DICKSON. We are estimating $5,000 for them, sir.

Mr. BORLAND. Are they caterpillar tractors?

Gen. Dickson. Yes, sir; I think these are caterpillar tractors, although in some cases we are using four-wheel drives. We have two types, but I could not tell you which is which.

Mr. GOOD. I am not clear as to the number of 2½-ton trucks. Is that two-thirds of a truck for each battery or for each gun?

Gen. DICKSON. For each battery.

Mr. GOOD. That would be about ——— tractors for the ——— batteries?

Gen. DICKSON. Yes, sir; and then 24 times ——— for pulling the pieces and ammunition vehicles.

Mr. GOOD. And then eight times for the 4-ton trucks and trailers?

Gen. DICKSON. Yes, sir.

Mr. SLEMP. Does this include any equipment that you hold as a reserve or would they be in constant use?

Gen. DICKSON. What we are asking for here is to get the motor equipment that has been prescribed for the batteries for which appropriations were previously made and we then include a reserve. We need a reserve of the motor equipment the same as we do for the batteries.

Mr. BORLAND. Your reserve equipment is on the same basis that your reserve batteries are?

Gen. DICKSON. To start with we are asking 50 per cent of what goes with a combatant division for training purposes, and then 50 per cent for replacements. The wear and tear on the motor equipment is very much greater, or the replacement is going to be very much greater, so we learn from the experience of the British and the French, than it will be on the guns and carriages.

Mr. BORLAND. Is this motor equipment used for any other purpose or is it held for that particular battery?

Gen. DICKSON. As I understand, the motor equipment that draws the guns is always kept for that purpose. The motor equipment with the ammunition vehicles goes back and brings ammunition up to the dumps and hauls it from the dumps to the batteries. The ammunition vehicles, as I understand, are sometimes with the batteries and then sometimes they go back with the artillery train to replenish the dumps.

TRENCH WARFARE MATERIAL.

The next item is trench warfare material. We are asking for ——— 3-inch Stokes trench mortars, $408,000; ——— 4-inch Stokes mortars, $70,000; ——— 6-inch Newton trench mortars, $1,020,000 ——— 240-millimeter trench mortars, $2,550,000. That makes a total for trench warfare mortars at $4,048,000.

Mr. **Borland**. That is still based upon your assumption of three armies?

Gen. **Dickson**. Three armies, sir.

Mr. **Borland**. And this is your allotment for that proportion of men?

Gen. **Dickson**. For the equipment that they actually have, for the reserve, and for the training of the men as they are brought into service in this country.

Mr. **Borland**. Does that depend in any degree upon the amount of mileage we are defending, the mileage of trenches under our care?

Gen. **Dickson**. Indirectly, yes, sir; because a division is supposed to occupy a certain length of front. Our computations, however, were not based on the length of front that we are occupying, but were based on the number per divisions, corps, and armies that Gen. Pershing gave us.

Mr. **Borland**. This is your entire trench mortar program.

Gen. **Dickson**. This is in addition to what was included before and brings us up to the full total that we must have for three armies and for the training of three armies.

Mr. **Borland**. How much of this do you expect to retain in the United States for training purposes, did you say 50 per cent? That would be 25 per cent, would it not, because you estimate 100 per cent for the initial equipment.

Gen. **Dickson**. Approximately, one-third.

Mr. **Borland**. For training purposes?

Gen. **Dickson**. Yes, sir; that is to start with.

Mr. **Borland**. I understood you to say that you figured your initial equipment and you added to that 50 per cent for a reserve and 50 per cent for training purposes.

Gen. **Dickson**. Yes, sir; for the guns. For instance, you take the actual number for the three armies and you add 50 per cent to that for training purposes, and most of that is in this country, although some of it is on the other side and will be, and then we add 50 per cent to establish the necessary reserve and get the stock ready for replacement.

Mr. **Borland**. So your training equipment is practically 25 per cent of the total estimated amount?

Gen. **Dickson**. Yes, sir.

Mr. **Borland**. What special training is necessary for the troops in using trench mortars?

Gen. **Dickson**. My understanding is that in the training camps the French and British officers are paying the greatest attention to teaching our men how to handle trench mortars and to throw grenades, and also the use of gas. They claim that that is practically new warfare which our people know nothing about and that it is very important, and they are laying the greatest stress on it.

Mr. **Borland.** It may be there is a great deal to be taught about it, but my impression was that in handling a fieldpiece, there was a certain gun crew and every man must know his place and must act at once so that what he does will fit in with what every other man in the crew does, and that they must all work together, and my impression was that that required a great deal of training. As to these trench mortars, from what I saw of them it seemed to me that they were simply a stovepipe and the man simply put in the charge and it went off. I do not know how many men it takes to operate it, or what particular training a man would have to have to operate it, but it looked like to me that an able-bodied man who could lift those charges could operate it after about 10 minutes of training.

Gen. **Dickson.** Col. Ragsdale can tell you the actual details of that better than I can.

Col. **Ragsdale.** I saw the stovepipe at the same time Mr. Borland saw it, and that is the 3-inch Stokes. That gun is carried forward with the infantry. When the infantry get out of touch with the artillery and can not command any heavier fire to demolish any particular formation they want to demolish, they have to lug up this gun. Two men carry the gun and one man the platform and they have about 12 of these guns to a company.

Mr. **Borland.** Colonel, are they operated by the infantry?

Col. **Ragsdale.** There are infantry companies, but there are special Stokes mortar companies, and the bulk of the men carry the ammunition. They carry six rounds each.

Mr. **Borland.** Do the 12 men operating the Stokes mortar carry rifles? Are they regular infantrymen belonging in the ranks?

Col. **Ragsdale.** They do not carry rifles, as a rule. They carry pistols so they can defend themselves in close quarters. There are 12 mortars to the company, and, of course, the rest of the men are helping out, carrying up ammunition or defending the artillerists for the time being, if they get into a hot place. Of course, they have to be trained very carefully, because it is largely a case of judgment, and the fire-control instruments are of the crudest. Although they say they want them, in talks with men who have actually operated these things, I do not believe they have availed themselves of these refinements. It is quite a wicked piece, and is frequently shot at a range of only 200 yards. It has a maximum range of about 750 yards. As to the rapidity of fire which you get from them, I have seen eight or nine projectiles in the air at the same time.

Mr. **Borland.** I was interested to know, Colonel, whether they were men especially detailed to handle these pieces or whether they were handled by the ordinary infantrymen who happened to be in that part of the trench.

Col. **Ragsdale.** They assign a certain company.

Mr. **Borland.** And then they detail certain men from that company to operate them?

Col. **Ragsdale.** That company is a Stokes mortar company, and will be taken bodily out of the regiment.

Mr. **Borland.** You have a company that is assigned as a trench mortar company, and it does not carry rifles?

Col. **Ragsdale.** They just carry enough to protect themselves should they get in close quarters, and they are not riflemen. The 4-inch Stokes is a different weapon. Those are carried by the gas and flame regiments. The 4-inch Stokes is primarily a chemical gun. It has a little longer range and fires an incendiary shell or gas shell or a gas shell employing a type of gas that acts immediately, such as the tear-producing gases, that are not necessarily very deadly, or a flame shell or a smoke shell. Now, if they get into a bad fix and want to screen their retreat or operations, this 4-inch Stokes mortar company is sent over, and they make a regular screen of smoke to hide that operation. The 4-inch Stokes company is not a part of the regiment. It is a brigade or division company.

Mr. **Borland.** How many men compose it?

Col. **Ragsdale.** About 250 men.

Mr. **Borland.** And how many weapons go with the 250 men?

Col. **Ragsdale.** I believe they have the same number, 12, but I am not positive.

Gen. **Dickson.** That is what this organization chart shows.

Mr. **Borland.** What do you do with the 6-inch Newtons?

Col. **Ragsdale.** The 6-inch Newtons and the 240-millimeters are tactically employed in about the same method. The only difference is that the 6-inch mortar is brought up closer to the front than the 240-millimeter. These are placed in individual pits in batteries of 6, and the ammunition is in the dugout, and they have a screen over the top of this hole. The hole is not more than 5 or 6 feet in diameter, and they bring these things up at night and plant them at night, and it forms an artillery that the infantry again can call on to do special work. If there is a machine-gun emplacement or a listening post that has been advanced into dead man's land, the infantry can send word back to their own artillery to open up on this machine-gun emplacement, or with the 6-inch. They are employed very frequently for tearing away barbed wire; they open up on the barbed wire and blow it to pieces where the infantry want it blown to pieces, and they also use the 6-inch and 240-millimeter against machine-gun emplacements and dugouts.

Mr. **Borland.** So, while they constitute a company of the Infantry, they are a sort of separate Artillery branch with the Infantry troops?

Col. **Ragsdale.** Yes, sir. The 6-inch and the 240-millimeter are not manned by Infantry. They are manned by Artillery companies; but there is a very much closer cooperation between the Infantry holding a special sector and the trench motar artillery is handled as a part of their own outfit, and for that reason the trench-mortar artillery does not enter into the general Artillery program. It is a part of the Infantry in the front-line trenches and it is always at their disposal. Of course, it is true the 75-millimeter batteries are also at their disposal, but these trench mortars are particularly at their disposal.

Mr. **Borland.** You spoke apout the 4-inch Stokes being used with the flame regiments. What is meant by that?

Col. **Ragsdale.** There are a number of gas and flame regiments which have been formed by the Engineer Corps and assigned to the gas service in France. Those regiments will be used for the purpose of handling the 4-inch mortars in an attack where they expect to go forward or in the emplacements or gas cylinders that I referred to last Saturday, or in doing anything peculiar to gas warfare. and each company is trained in the use of the 4-inch Stokes.

Mr. BORLAND. Is the 4-inch Stokes used with the Infantry the same as the 3-inch?

Col. RAGSDALE. Yes, sir. You might find the 3-inch and the 4-inch Stokes batteries almost side by side, but they perform a different purpose; one is explosive warfare and the other is chemical warfare. The reason they do not employ the 3-inch for chemical warfare is that the size of the projectile is not large enough to contain an adequate amount of gas or smoke-producing material.

Mr. BORLAND. Far the greater number of these is the 3-inch Stokes?

Col. RAGSDALE. Yes, sir. The 4-inch is a special weapon.

Mr. BORLAND. And they carry an explosive shell?

Col. RAGSDALE. Yes, sir.

Mr. BORLAND. Intended to explode in the enemy's trenches and do a maximum amount of damage there by the explosion?

Col. RAGSDALE. Yes; they are very effective.

Mr. BORLAND. I got the impression from watching that Stokes that it was comparatively a simple thing to operate them, and, in fact, that they were a sort of amateur device, anyway.

Col. RAGSDALE. I think the invention of the Stokes mortar is one of the most ingenious things of the war. It was a case of getting a weapon which the men would readily take to and could perform good work with without long training, although the training they do have is very intense, and a certain number of men have to be trained in obtaining accuracy of fire by not the usual methods of fire control.

Mr. GOOD. To what extent are they now used in the present war?

Col. RAGSDALE. For the past two years the British have used them very extensively. I heard one statement that the British had 10,000

Mr. GOOD. Do the Germans use them to any extent?

Col. RAGSDALE. The Germans do not employ them. The French are going to use them. The French are going into it on quite a large scale.

Mr. GOOD. What do the Germans use as a substitute?

Col. RAGSDALE. The German tactics are rather different from the British, so I understand, and it does not quite suit their tactics; in other words, they do not require them for their tactics. The British method is to constantly harrass or put over ammunition, even if it is an annoyer rather than a destroyer, and they like to have something that they can keep the men busy with and keep the enemy harassed. and they use these from the trenches and now always in an attack.

Mr. BORLAND. Colonel, are you purposing to get any of these trench mortars with a breech loader, or is this the old-fashioned type?

Col. RAGSDALE. The 240-millimeter is a breech loader. It is a combination—you put the projectile in the muzzle and you put the charge in the base—and I might say that our new developments are all breech loaders.

Mr. BORLAND. How about the 3-inch; do you adhere to the old type?

Col. RAGSDALE. Yes, sir. I have followed trench mortars for a good many years, even before the war, and have been so pleased with the Stokes that I can scarcely conceive of any improvement coming along that line.

Mr. **Borland.** How much do they cost?

Gen. **Dickson.** The 3-inch cost $150 apiece; the 4-inch cost $175 apiece.

Mr. **Borland.** And you think you can do a lot of execution with a $150 gun?

Col. **Ragsdale.** Yes, sir; that is the most efficient weapon of the kind they have.

Mr. **Slemp.** Is this what Gen. Pershing asked for?

Gen. **Dickson.** Yes, sir.

Mr. **Borland.** What is your next item?

RAILWAY ARTILLERY—ESTABLISHMENT OF PLANT TO MANUFACTURE.

Gen. **Dickson.** We come now to railway artillery. -- railway mounts must be furnished for 10-inch guns at $------ each, or a total of $12,960,000. -- railway mounts must be furnished for 12-inch guns at $------, $1,920,000; -- service cars for the 10-inch and the 12-inch guns, at $------, $2,310,000.

Mr. **Borland.** What is a service car?

Gen. **Dickson.** They carry repair parts and means for making repairs. They carry the ammunition service equipment and the accessories which you have to take along to serve the guns. As a rule, two 10-inch guns or two 12-inch guns, put together, constitute a battery, so you have to furnish for each battery a service car.

Mr. **Borland.** Do you mean one 10-inch and one 12-inch gun?

Gen. **Dickson.** No, sir; two 10-inch guns will make a battery, or two 8-inch will make a battery, and in each battery of two guns you have to provide a service car.

Mr. **Borland.** And they cost ——— each?

Gen. **Dickson.** Yes, sir; with the equipment that goes on the car for making repairs.

Mr. **Good.** There must be a great deal of equipment?

Gen. **Dickson.** Yes; you must have equipment for handling ammunition, such as trucks and hoists. One service car carries everything necessary to serve two guns.

Mr. **Eagan.** General, your railway mounts cost ——— more for the 12-inch than the 10-inch gun?

Gen. **Dickson.** The reason for that is that the 10-inch guns are of the Schneider type, which do not allow you to traverse the gun on the car. There are just two side girders or frames in which the gun trunnions rest, and when you fire the gun the car runs to the rear, and you have to curve your track so as to get your direction of fire. These 12-inch gun cars are made so you can get a certain amount of traverse, which is a more expensive type.

The next item is — railway mounts for the 12-inch mortars that are to come out of the fortifications, at ———.

Mr. **Borland.** $13,500,000. The next item is — service cars for 12-inch mortars, at ———.

Gen. **Dickson.** Yes; $2,400,000. You will notice there that one car serves three mortars. The next is — 14-inch railway mounts and guns; that is, there are — guns and — railway mounts. Their cost is $26,880,000. Now, Mr. Chairman, that is one of the items that was in the deficiency bill which was submitted in March, and that is in addition to the original estimates and to these supplemental estimates.

Mr. GOOD. General, I am not quite clear with regard to the statement that you have made concerning the things you propose to secure. For the current year you had $1,124,200,000, and you have submitted estimates, with supplemental and additional estimates for the next fiscal year, aggregating $1,322,151,119. Now, the things you have been detailing are the total amounts that you propose to get with all the appropriations that you have received and the contract authorizations for the present year and those that you are estimating for for next year.

Gen. DICKSON. The items I have been reading, sir, are those which we have got to have out of the money we are asking for in this supplemental estimate only.

Mr. GOOD. It has nothing to do with the appropriations and the contract authorizations for the present fiscal year?

Gen. DICKSON. No, sir; this is all in addition to what was estimated for last fall.

Then, there are — service cars for the 14-inch guns and railway mounts, which cost $2,880,500; — 16-inch howitzers and railway mounts therefor, — each, $12,000,000; — service cars for the 16-inch howitzers and railway mounts, $2,300,500; a plant for making these 14-inch guns and 16-inch howitzers, $40,000,000; a total for this railway artillery of $117,151,000.

Mr. BORLAND. What have you done in the direction of getting these 10-inch railway mounts? Are they new guns?

Mr. BORLAND. The money asked for here is simply for the mounts, and not the guns.

Gen. DICKSON. Yes; — 10-inch mounts.

Mr. BORLAND. You have the guns?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. How are you getting along with those railway mounts?

Gen. DICKSON. They are coming along very well.

Mr. BORLAND. Is one to be tested next month?

Gen. DICKSON. I am quite sure one is to be ready then; yes, sir.

Mr. GOOD. Then, you have been buying some of these out of last year's appropriations?

Gen. DICKSON. We started under the old appropriations to save time. We have some contracts that we know we will not have to make cash payments under until we get the money here, so that we have incurred a deficit.

Mr. BYRNS. You have been borrowing from those sums?

Gen. DICKSON. Yes, sir; and as the money comes due on the work on this materiel we are using the money that we will not have to disburse until this appropriation becomes available.

Mr. BORLAND. Over how long a period will the deliveries on these 10-inch railway mounts extend?

Gen. DICKSON. There are — to be made in this country, and the last one will be finished in October, and we are buying certain raw materials, like plates, etc., and making some of the parts—a few of the parts—and sending them over to France, and they are making the others for us.

Mr. **Borland**. You say the last will be finished in October. Do you mean 1918 or 1919?

Gen. **Dickson**. October of 1918.

Mr. **Borland**. How long ago did you give the order for them?

Gen **Dickson**. I will have to get that for you.

Mr. **Borland**. Now, about these 12-inch railway mounts. What is their condition? Have you already given an order for them?

Gen. **Dickson**. Yes, sir.

Mr. **Borland**. When do you expect deliveries?

Gen. **Dickson**. They are to be delivered completed in December of this year.

Mr. **Borland**. Are all of them made here?

Gen. **Dickson**. They are all made in this country; yes, sir.

Mr. **Borland**. As to your — sets of service cars, has the order been given for them?

Gen. **Dickson**. Yes, sir.

Mr. **Borland**. All of them?

Gen. **Dickson**. All of them.

Mr. **Borland**. Are they made in this country?

Gen. **Dickson**. Yes, sir.

Mr. **Borland**. How are they coming along?

Gen. **Dickson**. They are coming along with the carriages. They are easier to make than the carriages.

Mr. **Borland**. Was anything appropriated on these accounts in previous appropriations?

Gen. **Dickson**. No, sir.

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Gen. **Dickson**. To build those 14-inch guns; yes. In A. of F. "L," which is the appropriation you make for maintenance and repair, we have — more of those 14-inch guns, because Gen. Pershing says he must have — guns for each mount.

Mr. **Borland**. That is, spare guns?

Gen. **Dickson**. Yes, sir. In that same appropriation we have — of the 16-inch howitzers, so that with the — here that makes a total of —. In order to build the — 14-inch guns that are to go to the A. E. F., plus four that we must furnish to the proving ground for proof firing of projectiles and powder, and to build the — 16-inch howitzers that are to go to the A. E. F., plus the four we must have at the proving grounds for proof firing of projectiles and powder, we must build a plant.

Mr. BORLAND. So that you are planning a $40,000,000 plant for those guns?

Gen. DICKSON. ——— 14-inch guns and — 16-inch howitzers.

Mr. BORLAND. Does that include your railway mounts? Are you going to build them there, too?

Gen. DICKSON. No; existing shops will be used for them. In that plant we are including facilities for the manufacture of 12-inch, 14-inch, and 16-inch projectiles, because there is not enough producing capacity in this country to make the projectiles we will have to get for those guns.

Mr. BORLAND. Is that the plant you are building below Pittsburgh at the new arsenal?

Gen. DICKSON. That is the plant that is to build the 14-inch guns and make the projectiles. It was found that the cheapest way to get these howitzers was to make an addition to the works of the Midvale Steel Co.

Mr. BORLAND. That will be a new Government arsenal?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. For the manufacture of large ordnance, heavy guns?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. This estimate of $420,000 per gun and $300,000 per howitzer does not include any portion of the amortization of the plant?

Gen. DICKSON. No, sir.

Mr. BORLAND. You have a separate plant item?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. How do those prices compare with what you would have had to pay the Midvale Co. if they had made them in their own plant?

Gen. DICKSON. Practically the same, sir, but they have no plant that is available to make these; their plant is chock full of work.

Mr. BORLAND. How do you expect to organize a force and an overhead force to operate a plant of that size?

Gen. DICKSON. That is one of the reasons for selecting the Midvale plant, because we did not have to organize a new supervising force, and we will utilize the operating force there to practically its full capacity, because you could not stretch it much beyond that.

Mr. BORLAND. This is practically adjacent to the Midvale Co.'s plant?

Gen. DICKSON. Yes; it is on land right opposite the present plant.

Mr. BORLAND. Is it to be operated under the Midvale organization?

Gen. DICKSON. It will be operated by that organization during the building of these particular howitzers; yes, sir.

Mr. BORLAND. Will they act as the Government's agent?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Will they furnish the labor force?

Gen. DICKSON. Yes, sir.

Mr. **Borland**. And the supervisory force?

Gen. **Dickson**. Yes, sir.

Mr. **Borland**. And the Government furnishes the material?

Gen. **Dickson**. Yes, sir.

Mr. **Borland**. What kind of an arrangement have you with the Midvale Co.?

Gen. **Dickson**. The details of that contract I do not know. Col. McRoberts can tell you about that. It was very recently closed.

Mr. **Borland**. What are we paying $40,000,000 for? Are we constructing a new plant or taking over a portion of their plant?

Gen. **Dickson**. We are paying out of this approximately $6,500,000 for the buildings, the machine tools, and the equipment necessary for the building of these howitzers.

Mr. **Borland**. What is the rest of the $40,000,000 for?

Gen. **Dickson**. About $33,500,000 will be required for putting up a plant in which to build the 14-inch guns.

Mr. **Borland**. Putting up a new plant?

Gen. **Dickson**. Yes, sir.

Mr. **Good**. Sixteen-inch guns or fourteen-inch guns?

Gen. **Dickson**. Fourteen-inch guns.

Mr. **Borland**. For the 16-inch howitzers they have the machine tools?

Gen. **Dickson**. No, sir; we had to buy new machines for the purpose of building those howitzers.

Mr. **Borland**. For what are you buying the plant and machine tools—for the 16-inch howitzers or the 14-inch guns?

Gen. **Dickson**. For both the 16-inch howitzers and 14-inch guns.

MOTOR REPAIR EQUIPMENT.

(See p. 218.)

Mr. **Borland**. Now, what is your next item?

Gen. **Dickson**. The next item is motor repair equipment for 3,000,000 men.

Mr. **Borland**. What do you mean by motor repair equipment for 3,000 000 men? Is that something separate from the battery equipment?

Gen. **Dickson**. Yes, sir. Each division and corps has a motor-truck repair shop. Each division has an ordnance repair shop on motor trucks, which makes 30, and then the five corps each have to have 1, which is 5 more, which makes a total of 35 that have to be with one army. We are allowing practically 50 per cent, or 17, for the training depots in the United States, which makes 52. Now, to provide the replacements, just the same as we are doing for the batteries, we add 50 per cent to that, which makes a total of 78 for one army.

Mr. **Borland**. At $105,000 each?

Gen. **Dickson**. Yes, sir; or a total of $30,550,000. (Reduced later to $17,955,000.)

Mr. **Borland**. What sort of repair outfit is that?

Col. **Hillman**. A mobile ordnance repair shop consists of three motor trucks provided with a certain number of small machine tools and the necessary hand tools, so they can make the ordinary emergency repairs to guns and carriages, which they have to make close to the front, so the material does not have to go back to the repair shop: also three motor trucks for repairing horse equipment and personal equipment of the men, a few sewing machines and things of that sort, so they can repair the equipment up close to the troops. Then, there are three supply trucks that go along with them to carry the supplies and the spare parts for making quick repairs, and six ammunition trucks, or a total of 15 trucks. The unit has a personnel of 3 officers and about 50 men.

Mr. BORLAND. Each one of these 171 units consists of 3 officers and about 50 men?

Col. HILLMAN. Yes, sir.

Mr. BORLAND. And they carry a portable forge and lathe, etc.?

Col. HILLMAN. Yes, sir.

Gen. DICKSON. There are 15 four-wheel-drive trucks in each one of these ordnance automobile repair shops; 6 of them have bodies for doing anything in connection with ammunition, and 3 contain supplies for the battery, spare parts, cleaning material, etc.; 3 of them are rigged up as repair shops for artillery; and 3 of them are fixed up for repairing equipment and miscellaneous articles. For instance, if a belt has a rip in it, instead of throwing it away you can turn it in and have it fixed up and get it right back again. This is the organization for a division.

Mr. BORLAND. You are estimating now for 3 armies and 3,000,000 men. Have we estimated before for any of these things for the existing authorized force?

Gen. DICKSON. No, sir; we have got to start at the bottom.

Mr. BORLAND. Why have we not estimated for anything of this sort before?

Gen. DICKSON. This is a thing that has been worked out quite recently, as I understand it.

Mr. BORLAND. Is it similar to the organization of the foreign armies?

Col. HILLMAN. It approximates the organization of the foreign armies. It is a little bit heavier unit than they have over there. We have about 15 trucks and my recollection is they have seven or eight horse-drawn vehicles, and they are motorizing as rapidly as they can get the motors and trucks.

Mr. BORLAND. We have not anything of this kind now anywhere in our program; in other words, this is brand new.

Gen. DICKSON. This is new, as I understand it.

Mr. BORLAND. How many did you say there were for a division?

Gen. DICKSON. There are 15 trucks for a division.

Mr. BORLAND. And 30 divisions in an army, including the replacement divisions?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Now, of course, we understand there is a repair shop in France and perhaps two of them.

Gen. DICKSON. They are big plants way back to the rear, to which you would not send a single thing which you could repair at the front

Mr. BORLAND. And this is for making emergency repairs?

Gen. DICKSON. Yes; and is right with the Artillery all the time.

Mr. BORLAND. We also understand that each one of these things increases the number of noncombatants we are having to provide over there.

Gen. DICKSON. Yes; which is about 300,000 out of each army of approximately 1,375,000.

Mr. BORLAND. Who originated this estimate?

Gen. DICKSON. The equipment and allowance is prescribed by the General Staff in Tables of Organization 41 and 112.

Mr. BORLAND. When was it prescribed by the General Staff?

Gen. DICKSON. I do not know. When a thing like this comes up it has to go to the equipment section of the General Staff, and they approve it and say, "Issue out so much per army or per division."

Mr. BORLAND. Where does it originate before it gets to the General Staff, who plans it?

Gen. DICKSON. Sometimes the suggestion comes from the Ordnance Department that such and such equipment is necessary and sometimes it comes from Gen. Pershing.

Mr. BORLAND. What is the case about this particular equipment?

Col. HILLMAN. This was planned in the Ordnance Department in conjunction with a committee of the General Staff. It was worked up by Col. Moody, who is in charge of all the motor equipment and motor equipment repair units. The general plans were started even before we got into the war.

Gen. DICKSON. We have always had repair vehicles, you know.

Mr. BORLAND. But apparently not on such a large scale as this.

Gen. DICKSON. No, sir; and we have never been as far away from home.

Mr. BORLAND. It is not so much a question of being far from home as being far from your general shop.

Gen. DICKSON. Yes.

Mr. BORLAND. And your general shop is back of your lines in France?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Motor equipment for the corps mobile shops, 15 units. This is 15 more units for the corps.

Gen. DICKSON. Each division has one and each corps has to have one.

Mr. BORLAND. Then, there are 150 divisional tractor units. They are for repairing the tractors.

Mr. BYRNS. You have these motor-repair units, or shops, for each division?

Gen. DICKSON. Yes, sir.

Mr. BYRNS. Then, why do you need them for a corps?

Gen. DICKSON. Because certain artillery is assigned to a division, which is under the command of a division commander, which must be kept in order. Now, certain other artillery is assigned to the commander of a corps, and you have to provide the means for repairing that, because he is liable to put that in at any place on the front that he is holding. It is entirely independent. Now, the next item is for the repair units for taking care of heavy artillery. The foregoing repair field guns, carriages, ammunition vehicles, and personal equipments, and the latter are for repairing the heavy artillery assigned to the Army. You have got to take care of heavy guns on railway mounts, and that takes a different repair unit.

Mr. BORLAND. For 606 brigade motor units you have $25,000 each. or $15,150,000. What are they for?

Gen. DICKSON. In case of the brigade motor units, they allow 1 for each of 25 brigades and 2 for each of 5 brigades, so that each division has 35 units and each army has 8 units for repairing tanks, or a total of 43 per army. Now, we have added 50 per cent in order to provide the artillery for training purposes, and then 50 per cent for replacement.

Mr. BORLAND. Are you taking into consideration at all the fact that there will be motor-repairing equipment connected with the Quartermaster Corps—that there will be thousands of motors there connected with the Quartermaster Corps?

Gen. DICKSON. They provide, I think, for their own repairs only. My understanding of that is very clear and distinct with the Chief of Staff; that is, that we must estimate for all of the equipment which we supply and for its maintenance.

Mr. BORLAND. Independently of any other facilities that may happen to be there.

Gen. DICKSON. Yes. If they follow the plan we do they will not provide any more equipment than they actually need. The only thing where we are keeping off is in the salvage that is being carried on in the rear; we are not asking any money with which to provide salvage facilities in the rear. The Quartermaster is going to handle all of that.

Mr. BORLAND. As I understand it, you take, first, the normal equipment which is, we will say——

Gen. DICKSON (interposing). One for each division would be 30 for one army.

Mr. BORLAND. You add 50 per cent to that as a reserve?

Gen. DICKSON. For the troops that are under training, yes.

Mr. BORLAND. You add 50 per cent, first, for the troops that are under training?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. That is 45.

Gen. DICKSON. Yes, sir.

Mr. BORLAND. And then you add 50 per cent of the 45?

Gen. DICKSON. No; 50 per cent of the 135 for replacements.

Mr. BORLAND. Of the 45 or of the 135?

Gen. DICKSON. For instance, you are figuring on an army now, and you are going to provide one of these repair shops for each division, or a total of 30 for initial equipment. Now, one-half of that is added for training——

Mr. BORLAND (interposing) That is, 135?

Gen. DICKSON. Yes, sir; for three armies; for replacements we add one-half to that.

Mr. BORLAND. Half of the 135?

Gen. DICKSON. Yes.

Mr. BORLAND. That is 67½.

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Now, you have added 45 for the training. Do you estimate that where the training occurs in the training camps in the United States you are going to need as many portable kilts to the number of guns as you would in the field?

Gen. DICKSON. To start with, perhaps no; but when the artillery goes to the other side, yes. Then you have got to have every bit of it.

Gen. DICKSON. But you have got to keep them in repair.

Mr. BORLAND. You have a repair shop in each training camp?

Gen. DICKSON. No, sir.

Mr. BORLAND. Right on the ground?

Gen. DICKSON. Nothing except these motor repair shops.

Mr. BORLAND. And you will not be a long distance from your facilities?

Gen. DICKSON. No; but we are furnishing this very equipment to these camps; we are counting on furnishing this very equipment for use as a repair shop at each of the cantonments.

Mr. BORLAND. You are furnishing portable repair facilities in exact proportion to your mobile artillery?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Whether the mobile artillery is in the field or in the training camps?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Then what I want to ask you is this: What necessity is there for this portable repair equipment in training camps where you have local repair shops?

Gen. DICKSON. We have no local repair shops at the cantonments.

Mr. BORLAND. You have not?

Gen. DICKSON. No; this very equipment is what we propose to put there with which to do the repairing.

Mr. BORLAND. And you have no other kind of a repair shop?

Gen. DICKSON. No.

Mr. BORLAND. You will not have a local repair shop at each of the cantonments?

Gen. DICKSON. No, sir. We want them to learn to use this material.

Mr. BORLAND. What are you doing at Camp Meade, where you have a certain amount of artillery for use in training?

Gen. DICKSON. We are trying to get this equipment to them.

Mr. BORLAND. I suspect the fact is that you have no guns to repair.

Gen. DICKSON. Not very many now, I am sorry to say.

Mr. BORLAND. At what stage of the proceedings are we to expect that you will have the full equipment of artillery in the training camps which would need to be repaired and taken care of?

Gen. DICKSON. We will have it by the time we can get these repair outfits.

Mr. BORLAND. When is that?

Gen. DICKSON. On a very conservative estimate we will supply Gen. Pershing with whatever artillery he wants and we will have this 50 per cent for training before July, 1919.

Mr. BORLAND. You are asking for another 50 per cent added to the 135 units for wastage or as a reserve supply in the field?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Is it to be supposed that the wastage and need for a reserve supply in regard to these repair kits will be in exact proportion to the wastage in the field artillery? That is the proportion you are estimating for wastage in guns, by reason of the destruction of the guns, the need for relining them, their capture or being put out of commission, and is it to be supposed that your wastage in repair kits will keep up with your wastage in guns?

Gen. DICKSON. No, sir; but the situation is this: We have not yet had the experience upon which to build a definite program for replacements, but we have drawn on the experience of the British and French, and by their advice are starting out with this 50 per cent. Now, as time goes on we will use up a great deal of that 50 per cent. and all of it in time, of course, but during that period we will have gotten the actual data that will show definitely what percentage we should supply each month for replacements. Then the amount of money asked for maintenance is going to be very much less. But unless we start out—at least so the British and French informed us and cautioned us to prepare for—with what looks like a very high allowance for wastage we are liable to be in a position of losing matériel. either through capture or by being disabled, and not having the matériel to put in its place on the firing line.

Mr. BORLAND. I can readily understand that there will be a large loss in wastage of guns in active service, but that large percentage might not apply to other matériel that is not quite as much exposed.

Gen. DICKSON. I think your point is well taken, but until we can get the experience and know what our replacements are going to be, it was considered safe to use this same percentage.

Mr. BORLAND. In making a program of that kind we have to take into consideration the fact that all of the facilities we devote to this sort of thing are curtailing activities in some other direction, and that we might be using the mechanics and matériel elsewhere, because it is all a question of priorities right now; it has gotten down to the basis of priorities and in this bill we must get down to a basis of priorities. It might be safe to do this, but it is imperative to do so?

Gen. DICKSON. This is submtited in accordance with the best judgment of the Ordnance Department and the General Staff.

Mr. BORLAND. This is nearly $130,000.000 simply for repair kits.

Gen. DICKSON. For repair shops to take care of all kinds of equipment, guns, carriages, and all kinds of motor traction.

Mr. BORLAND. We have not here the basis upon which to figure that item. It does seem to me that $129,882,600 is very high for repair kits, in view of the other large items we must consider.

Gen. DICKSON. It is a big sum of money for three armies; that is true. We will take that up and see whether the equipment section of the General Staff would be willing to reduce that 50 per cent.

Mr. BORLAND. $130,000,000 is a very large sum for repair kits, as I have already said, and they are practically junk when they come back. There would practically be no salvage.

Gen. DICKSON. Of course, it is a very important item.

Mr. BORLAND. It is $10,000,000 more than the whole railway-gun program. The whole railway-gun program is something over $110,000,000, including your new arsenal.

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Mr. **Borland.** And it is 33⅓ per cent of the total expenditure.

Gen. **Dickson.** Yes, sir. I will be very glad to take that up with the General Staff and state your ideas.

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PURCHASE OF NAVAL GUNS.

(See pp. 315, 320, 429.)

Mr. **Borland.** Your next item is for guns purchased from the Navy Department.

Gen. **Dickson.** Yes, sir. In order to give Gen. Pershing the number of guns that he asked for we got some guns from the Navy Department, and we have got to be prepared to pay them for those guns. There are —— 12-inch guns, —— 8-inch guns, and —— 6-inch guns which we got from the Navy and which we have got to pay for.

Mr. **Borland.** What 6-inch guns?

Gen. **Dickson.** We are building wheel mounts for —— 5-inch guns which we took out of our forts; then we are building —— wheel mounts for 6-inch guns, of which we got —— from the Navy, and took out of our forts ——. So we have got to pay the Navy for —— 6-inch guns.

Mr. **Borland.** Are we not going to return those guns to the Navy? Are they not lending them like we are lending guns from the forts?

Gen. **Dickson.** They do not look at it in that way; no, sir. Commander Pickering, of the Bureau of Navy Ordnance, stated the Navy Department would expect to be reimbursed for these guns.

Mr. **Borland.** What price are they charging?

Gen. **Dickson.** The cost of a 6-inch gun is $25,000 apiece; of a 12-inch gun, $50,000; and of an 8-inch gun, $42,000.

Mr. **Borland.** What relation does that bear to their cost?

Gen. **Dickson.** They claim that is what they cost them at the time they were made.

Mr. **Borland.** When were they made?

Gen. **Dickson.** I do not know, sir; I would have to find out.

Mr. **Borland.** Are they new guns or second-hand guns?

Gen. Dickson. They have been fired some, but they are in goo condition.

Mr. Borland. Are they guns that they have junked and superseded with something else?

Gen. Dickson. No, sir. There is still another item besides th —— 6-inch guns.

Mr. Borland. We will see about that Navy business, of cours That is merely a matter of bookkeeping, anyway, and ought not t be included in these estimates.

Gen. Dickson. They are also expecting to get from the Navy —— more 6-inch guns. And we are buying —— second-hand guns from Bannerman.

Mr. Borland. From whom?

Gen. Dickson. From Bannerman, who handles naval stores. He has —— 6-inch guns. They are in splendid condition and in good serviceable condition.

Mr. Borland. You say you are going to buy —— more from the Navy?

Gen. Dickson. Yes; they said they would let us have them, and we are estimating we will get those guns at $15,000 each. So that is the main item in this total of $3,297,000 for the Navy guns.

Mr. Borland. How many guns are included in that item of $3,297,000?

Gen. Dickson. There are —— 6-inch guns, which we are now proceeding to buy, —— of which we are going to get from Bannerman.

Mr. Borland. So they are not to be purchased from the Navy Department, as you have stated?

Gen. Dickson. We are buying —— from the Navy, sir.

Mr. Borland. But —— are coming from Bannerman?

Gen. Dickson. Yes, sir.

Mr. Borland. This item says, "To be purchased from the Navy Department"?

Gen. Dickson. Yes, sir; but that is not a correct statement.

Mr. Borland. That Bannerman item is not here?

Gen. Dickson. It is included in it. They are naval guns. There are —— from Bannerman and —— from the Navy, making a total of —— 6-inch guns in this lot. We had previously gotten —— 6-inch guns from the Navy.

Mr. Borland. Are the Bannerman guns 6-inch guns?

Gen. Dickson. Yes, sir.

Mr. Borland. What are they worth?

Gen. Dickson. We are estimating $15,000 on them. So if you make the Navy give us those guns do not forget to give us —— times $15,000, so that we can get the Bannerman guns.

Mr. Borland. ———— worth of guns——

Gen. Dickson (interposing). From Bannerman only.

LAND FOR TEMPORARY PROVING GROUNDS.

(See pp. 218, 284.)

Mr. Borland. How about the item for leasing land and providing temporary equipment for proving grounds? Is this for rushing the work on the proving grounds?

Gen. Dickson. No, sir. You know every gun and every carriage as got to be proof fired? We have a proving ground at Aberdeen nd another one, a small one, near the Rock Island Arsenal. We an not congest the railroad traffic in this country, nor would we be ustified in spending money to ship all the guns that are made and ll the carriages that are made to those two places for proof firing. Not only that, but out of every lot of ammunition we have to take o many projectiles and fire them. We have to test the fuses, we have to test the high explosives, and we have to test the powder. Further, the two proving grounds mentioned are utterly inadequate to test all this material, so we have made a very careful canvass of the situation. We have a map, for instance, with each plant that is producing projectiles, powder, fuses, guns, carriages, marked on it, and we know the number and we are trying to select temporary proving grounds for the war only which will give the minimum amount of haul from where they are produced to the place of proof firing. For example, we tried to get Camp Perry, which is a State target range on Lake Erie, in Ohio. We got it, but they took it away from us because they had to use it for special training courses in musketry. We have authority from the Secretary of War to get a piece of land right alongside of that site. That is in a splendid section. We are having a large quantity of ordnance made in that vicinity and therefor we can get this material to the testing place with a minimum amount of haulage and with small delay.

Mr. Borland. Where do you expect to expend this $4,000,000?

Gen. Dickson. One site is right alongside of Camp Perry, another is a small place at Scituate, Mass., to test carriages being made at the Watertown Arsenal and in Worcester; another is on Long Island Sound, not very far from Bridgeport, to test antiaircraft carriages being made in New Britain, and also to test other material being made in that vicinity; another one is at Watertown, N. Y., right near a plant that is making a number of carriages. Then, we had to get a proving ground near Lakehurst, N. J., for testing gas materials. We will have to locate some other proving grounds. In many cases we are getting simply a small piece of land and building a butt. For instance, a shop will be making recuperators, and we will send a certain number of carriages to this piece of land near the factory where they are making the recuperators, and as each recuperator is finished, it will be taken out and put in a gun and then proof fired, and that will then have to be taken back into the shop and dismantled and carefully examined and if necessary adjustments made.

Mr. Slemp. Have you made any provision for a proving ground near the plant at Pittsburgh, which is to be established?

Gen. Dickson. No, sir; we have not yet taken that up. We will probably either have to proof fire those guns at Aberdeen or at Sandy Hook.

Mr. Borland. General, can you give us some idea how much you expect to spend for the rental and the fitting up of these various grounds you have spoken of?

Gen. Dickson. The one at Scituate, Mass., will probably cost not to exceed $400,000.

Mr. Borland. How much is rental?

Gen. **Dickson.** I can not tell you whether it is going to be cheaper to buy the land or to rent it. That is being determined now. The one near Camp Perry is going to be a pretty big one, and that will probably cost, I think, approximately $1,000,000.

Tuesday, May 21, 1918.

MOTOR REPAIR EQUIPMENT.

(See p. 209.)

Mr. **Borland.** General, before we pass on, I understand you have brought here the officer who is in charge of the repair shop matter. and we will be glad to hear him.

Gen. **Dickson.** I have been in consultation, and I went into it pretty carefully. The replacements were computed on the same basis as the guns and carriages; we took the initial equipment and added 50 per cent for training, etc.; added those together; and then added 50 per cent for replacements. As a result of the investigation, we think that can be reduced from 50 per cent to 10 per cent under replacements, with this understanding, that if that proves inadequate you gentlemen will remember that a reduction was made and help us out for whatever experience may show is necessary.

Mr. **Borland.** We want to give you what is necessary to do the work, but at the same time we want to devote the money, the labor, and material to other uses if you do not need them.

Gen. **Dickson.** Bearing that in mind, we think that reduction can be made.

Mr. **Borland.** What change does that make in your estimate?

Gen. **Dickson.** Those items amounted to $129,882,600, and those changes reduced that to $80,090,000.

Mr. **Borland.** That is, figuring on the basis of 10 per cent for replacements instead of 50 per cent for replacements?

Gen. **Dickson.** Yes, sir.

Mr. **Borland.** Is that reduction exactly in proportion to the difference in percentage?

Gen. **Dickson.** We have worked it out very carefully. We took the initial issue, added 50 per cent to that for training, etc., and added 10 per cent for replacements instead of 50 per cent.

TEMPORARY PROVING GROUNDS.

(See pp. 216, 284.)

Mr. **Borland.** When we adjourned we were discussing this $4,000,000 item for leasing land and providing equipment for temporary proving grounds. It seems from the act of April 11, which you have produced, that you have power to buy land out of manufacturing appropriations, and this is a manufacturing appropriation, of course. Do you intend to buy any land out of that $4,000,000; and if so, what land?

Gen. Dickson. The department endeavored to obtain the use of Camp Perry because it is located very near to a very large number of plants that are making guns, carriages, and projectiles, but as Camp Perry is required for the training of marksmen it is intended to purchase a tract of land alongside of Camp Perry on account of its railroad facilities, and being on the lake it will enable firings to be made into the water. In addition to Camp Perry we have located on a little piece of ground at Scituate, Mass., in order to proof fire the 240 millimeter carriages made at the Watertown Arsenal, and some carriages being made in Worcester, Mass., the howitzers and guns for which are being made at the Watervliet Arsenal. By proof firing them in the vicinity of Boston it is understood from the ocean transportation people that that material can be shipped direct from Boston, thus reducing transportation to a minimum. There is some antiaircraft material being made at New Britain and some other material in the vicinity, so it is intended, we hope, to lease a small plot of ground on Long Island Sound, where we can proof fire those carriages.

Mr. Borland. Where on Long Island Sound—on the mainland?

Gen. Dickson. On the Connecticut mainland up above Bridgeport. There are a number of carriages being made at Watertown, N. Y., and there is very good opportunity for proof firing them there, the land required to be leased, as well as the facilities necessary, being small. Then I mentioned a piece of land near Lakehurst for testing gas. Our studies as to the facilities required for proof firing ordnance are not entirely complete as yet, and the facilities required will be dependent on the distribution of the orders, but the policy is being adopted of having as few of these places as possible and yet locating the proving facilities so as to reduce to a minimum the amount of transportation necessary, and it is intended to put up those proving facilities as near to the plants as we can. For instance, we are making recuperators and sending a half or one dozen guns and carriages there, so that as the recuperators are finished they can be tested at the plant.

Mr. Borland. It has been determined that it is cheaper to buy a piece of land close at hand than it is to transport these pieces for long distances and test them.

Gen. Dickson. Yes; to buy or lease land. The Ordnance Department prefers to lease the land, but it depends on which is the most advantageous to the Government in regard to price. It is more economical to do that for several reasons. The Ordnance Department had a very sad experience in December and January on account of the transportation facilities. I have been in pretty close touch with Mr. Adams, the director of inland transportation, and he advises very strongly that we do as little transporting for purposes of that kind as is practicable. In the case of these recuperators, they should be proof fired as close to the plant that makes them as is practicable, because after you fire each one you must take it into the shop, dismantle it, and examine all of the parts to see that they are in good condition. You then reassemble it, and it is ready for active service. If you ship the recuperators some distance away from the plant in which they are made you must ship them back again and then ship them to the port of embarkation.

Mr. BORLAND. The recuperator is the mechanism that controls the recoil of the gun?

Gen. DICKSON. Yes, sir. Take the case of shell. When a lot is finished we take a certain percentage of them and fire them to see that they withstand the ballistic tests satisfactorily; when they do, then the remainder of that lot will go to the loading plant. In the meantime some other company is making fuses. We fire a few rounds from each lot to know that they are all right. Then when the manufacturer completes the powder or the bursting charge we find it necessary—and safety requires it—to fire a few rounds. In the case of powder, you not only determine that the powder is satisfactory ballistically, but you fix the charge to secure the required muzzle velocity. High explosives are tested to determine their safety, and then when all of these components are put in the finished ammunition we again select a few rounds and fire them as a final check.

Mr. BORLAND. My understanding is that at Aberdeen they encourage the plan of sending in artillery shells and ammunition for tests by auto trucks, and that quite a large number of ammunition factories are so lacated that Aberdeen can be reached in a night trip by auto trucks?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. A truck can start the night before, or some time the previous day, and by traveling all night get to Aberdeen in the morning and deliver a load of shells which can be immediately tested, and by long-distance telephone the factories can be advised as to the result of the test?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Which saves practically a day's work on that lot of stuff?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. It not only assists the manufacturer very materially, but expedites the delivery of the stuff ultimately to the Government?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. And that is your idea in expediting these tests?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. You want to have them so closely connected with the ammunition factories that the tests will not delay the manufacture or delivery of the stuff?

Gen. DICKSON. That is right, sir.

Mr. BORLAND. That is your principal idea in selecting these temporary proving grounds?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. How many of them, if any, do you expect to retain, or are they all of a temporary character?

Gen. DICKSON. We expect to retain——

Mr. BORLAND. Of course, the one at Aberdeen and the one at Savanna are to be permanent?

Gen. DICKSON. Those are the only ones we expect to retain.

Mr. BORLAND. The rest we can class as temporary?

Gen. DICKSON. Yes, sir; they are to be temporary, and we are having the cheapest kind of buildings put up.

Mr. BORLAND. You will not expect to have any unkeep on them after this immediate necessity ends?

Gen. DICKSON. No, sir; we can dispose of them after the war ends.

PAYMENT FOR MATERIAL PROCURED ABROAD.

Mr. BORLAND. The next item is "Reservations required to cover procurement authorizations given to Gen. Pershing in cablegram No. 790, February 15, 1918, for which no appropriations are available, $21,852,500." Will you explain to the committee what that is?

Gen. DICKSON. Please read the next two items and then I will explain them together.

Mr. BORLAND. Additional allotments to Gen. Pershing, $58,000,000; and raw material for Gen. Pershing, estimated as 75 per cent of above reservations, $16,389,375.

Gen. DICKSON. The War Department, upon the recommendation and concurrence of the Ordnance Department, authorized Gen. Pershing to purchase a great many things abroad. Anything that can be purchased over there saves transportation, which, at least up to now, and probably for some time to come, is very important.

Mr. BORLAND. Does that include the field artillery and ammunition that is being purchased over there?

Gen. DICKSON. Yes, sir; it includes everything he is buying over there.

Mr. BORLAND. Is it paid for out of these items?

Gen. DICKSON. Yes, sir. The part that is in here is for mountain, field, and siege guns, and materials necessary for their manufacture; but it does not include ammunition; that is in another item.

Mr. BORLAND. The number of guns he purchases and the amount of shells and ammunition he purchases are figured into your general program, are they?

Gen. DICKSON. We are instructed to submit our estimates separately for what is being procured from France and England, and to estimate for the initial equipment that is to be entirely supplied from this country.

Mr. BORLAND. Let me understand that. You are going to buy over there, as I understand it, the initial equipment for 30 divisions?

Gen. DICKSON. That is what we hope to get.

Mr. BORLAND. And that will leave 60 divisions to be supplied over here?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. You say you are going to estimate separately for them?

Gen. DICKSON. Yes, sir; that is the idea.

Mr. BORLAND. I understood you were estimating for the whole 90 divisions here?

Gen. DICKSON. Yes, sir; we are asking you for that entirely independently of this money which is to cover the materials that we so far know that Gen. Pershing has ordered from France and England. We are also asking you to appropriate for 90 divisions, three armies.

Mr. BORLAND. What credit is taken, on your equipment for 90 divisions, for the amount that Gen. Pershing is purchasing abroad?

Gen. DICKSON. We are not taking any credit. We are asking you to appropriate in this country for three armies.

Mr. BORLAND. Notwithstanding what he is buying?

Gen. DICKSON. Yes; notwithstanding the fact that we expect to get enough for 30 divisions from France and England.

Mr. BORLAND. Then that is four armies?

Gen. DICKSON. That is practically what it amounts to in the artillery line.

Mr. BORLAND. How much of the equipment for 90 divisions is represented by these three items for Gen. Pershing?

Gen. DICKSON. That is enough guns and carriages for 30 divisions.

Mr. BORLAND. These three items represent enough guns and carriages for 30 divisions?

Gen. DICKSON. So far as he has yet told us how much money he must have to pay for what he has ordered; but we may have a larger bill than that.

Mr. BORLAND. Has he submitted to you any statement as to what he intends to buy with this money, and how does that statement compare with what he is going to need for one army?

Gen. DICKSON. There were some exchanges of cablegrams. We have what we call our famous Bliss 10 cablegram; and the answer to the famous Bliss 10 cablegram authorized the purchase by Gen. Pershing from the French and British of enough artillery for 30 divisions flat. Then he was asked to cable the amount of money that he required to pay for what he ordered. I have copies of the cablegrams here asking for these amounts.

Mr. BORLAND. Do those cablegrams show that these amounts cover the initial equipment for the whole 30 divisions?

Gen. DICKSON. No, sir; they do not state that. Here is one:

"To cover estimated cost of purchases from these headquarters it is requested that the following additional allotments be made for mountain, field, and siege guns and ammunition, $12,400,000."

That is in the next item that we are coming to. Here is another one where he asks for $58,000,000 under armament of fortifications "B." That is the second item, you see. The other cablegram called for a total of $166,000,000, of which practically $22,000,000 belongs under this item and the rest belongs under A. of F. "C."

Mr. BORLAND. There is about $96,000,000 in these three items?

Gen. DICKSON. Yes, sir; $96,241,875.

Mr. BORLAND. The question was: Is that the estimated cost of the entire equipment for 30 divisions, or are they only the estimates which he has submitted, and which are partial estimates of the requirements?

Gen. DICKSON. We do not know what the total cost of the artillery which he has ordered is going to be, but we do know that he has cabled to us to remit to his disbusing officer this amount of money.

Mr. BORLAND. Does he report to you or to anybody else as to the application of those funds?

Gen. DICKSON. The only report we get is as to the number of guns, carriages, etc., turned over to him.

Mr. BORLAND. But you do not get any report as to the number he expects to receive or the number he has ordered.

Gen. DICKSON. We know the total number he has ordered.

Mr. BORLAND. How do you know?

Gen. DICKSON. Because he gave it to us for the 30 divisions.

Mr. BORLAND. He has given you his program for the 30 divisions?

Gen. DICKSON. He said that he had ordered for the 30 divisions the initial equipment only; that is, without any spares.

Mr. BORLAND. You have a report that he has placed an order for the 30 divisions?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. That was your basis for the statement the other day that you were going to get 30 divisions?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. But all you know is that he is expecting to place orders for the 30 divisions?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Have you any definite report that he has placed the orders for the 30 divisions?

Gen. DICKSON. Yes, sir; we have it on this sheet here [indicating].

Mr. BORLAND. But you have no definite report as to whether this money will be sufficient to pay for the entire 30 divisions?

Gen. DICKSON. No, sir; and I do not think it will.

Mr. BORLAND. How much do you estimate it will take to pay for the entire 30 divisions?

Gen. DICKSON. We have not estimated for that as yet, because we do not know what it will be. We do not know the exact details; we have no information on this side as to the details of what the charges are going to be. We assume that the French, for instance, will charge us the actual cost, but we have to send over certain raw materials to replace some of the raw materials which they are using, and in other cases we have to send raw material in advance of when they will do the work.

Mr. BORLAND. And that is what you mean by this item, "Raw material for Gen. Pershing, estimated as 75 per cent of above reservations, $16,389,375"?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. What class of material is that?

Gen. DICKSON. These raw materials?

Mr. BORLAND. Yes.

Gen. DICKSON. Some of it is flange steel, some is bar steel, and some the forgings for guns.

Mr. BORLAND. And you purchase that out of this manufacturing fund here—out of A. of F. "C"?

Gen. DICKSON. A. of F. "B."

Mr. BORLAND. You purchase it out of this item, ship it to him, and charge it against his requisitions?

Gen. DICKSON. Yes, sir. We are trying to keep all of the accounts connected with what we get from the French in great detail and separately, and then we are trying to do the same thing for the British.

Mr. BORLAND. Does your department deal directly with the French, or does it deal with Gen. Pershing?

Gen. DICKSON. We have always cabled to Gen. Pershing and asked him to place the orders.

Mr. BORLAND. Then this represents the sum total of our dealings with the French?

Gen. DICKSON. That represents the sum total; yes; the total sum of money which he has asked us to remit to him to be used in making payments to the French and British that is chargeable to this appropriation.

Mr. BORLAND. I understand that; but do you remit to the French any other sums direct?

Gen. Dickson. I know of no payment that the Ordnance Department has made directly to the French.

Mr. Borland. It has made them all by these requisitions from Gen. Pershing, placing the money at the disposal of his disbursing officer?

Gen. Dickson. Yes, sir; he handles it over there entirely.

Mr. Borland. General, why were your estimates of production in this country based upon three full armies and your estimate of procurement in France based upon one full army of 30 divisions, making a total of four full armies? Why are we estimating for four armies when the program calls for a total of three armies?

Gen. Dickson. The proposition is like this: The French said it would be a favor and a help to the French Government if we ordered artillery from the French Government, because their producing capacity was in excess of what they needed, and that they would be were glad to use that producing capacity in our behalf. We knew that we could get the material over there much earlier, because the facilities and everything were in existence, than we could in this country, where we were having to create the facilities. Now, as long as the conditions will permit, we know they are going to deliver that material, but if they were smashed, then they could not. It takes a long time to produce artillery, so in order to be safe it was decided that we must order in this country for the three armies and try and get the money for that independently of what we were getting in France, so that if an unforeseen condition should arise so we could not get it over there we would still have enough in production in this country for three armies. Now, as the material is delivered the amount we will ask for in the future will be correspondingly reduced; that is to say, if we get enough for 30 divisions, when we add one more army, then we have not got to ask you for the money to duplicate what we get from France and Great Britain.

Mr. Borland. Then, in effect, you are ordering on the basis of having equipment for one spare army?

Gen. Dickson. Suppose an unforeseen condition arises that we do not get that artillery over there, then you are going to be in the position of having only ordered enough artillery for two armies and you are going to be without artillery for a part of one army.

Mr. Borland. So, as to one army, to wit, the army now abroad, or which will be assembled abroad this year, you are making an alternative order; you have one in France and one in this country?

Gen. Dickson. Yes, sir.

Mr. Byrns. You are at the same time creating a surplus, are you not, of a reserve of 50 per cent in this country?

Gen. Dickson. Yes, sir; but you have to have that for training in this country.

Mr. Byrns. You have a surplus for training and then you have an additional surplus for replacements?

Gen. Dickson. Yes, sir.

Mr. Eagan. This is an additional reserve?

Gen. Dickson. Yes, sir. We ask for enough guns to actually equip an army, and we ask for 50 per cent on top of that to take care of the training. Most of those guns are to stay in this country, although some are to be in France, because they have several artillery training camps in France and have to have artillery there.

Then we add those together, and then we are asking you for 50 per cent for replacement to create the reserve necessary in case we lose a lot of guns.

Mr. **Byrns**. Is this estimate you are submitting for the purchase of guns in France based on the same conditions as to a surplus for training, etc.

Gen. **Dickson**. No, sir; we are buying from the French the actual initial equipment for 30 divisions, and we asked them and they agreed that if we needed it they would give us the actual initial equipment plus 25 per cent. That is the maximum we are to get from them. If we do not come along all right in this country and get our reserves here, then we expect to get 25 per cent more, but that is as far as they were willing to go and as far as we thought was necessary.

Mr. **Borland**. Then your orders in France are based upon the initial equipment of 30 divisions, with an option to purchase 25 per cent more for replacements?

Gen. **Dickson**. Yes, sir; in other words; we are ordering —— 75-millimeter guns, which is exactly enough to equip 30 divisions. That is the way our order stands to-day. Then, we have asked France to supply 25 per cent more, but we hope we will not have to use that.

Mr. **Borland**. Then, in assuming we are going to get all of the equipment for 30 divisions during the year 1918 in France, you are basing that only upon the initial equipment of those 30 divisions?

Gen. **Dickson**. Yes, sir; that is all, just the bare initial equipment.

Mr. **Borland**. You are not getting the full equipment in accordance with your program for replacement and training?

Gen. **Dickson**. No, sir.

Mr. **Eagan**. Instead of 50 per cent for replacement and for training you are getting 12½ per cent?

Gen. **Dickson**. We can get on the initial issue 25 per cent, whereas in this country we must have on the initial eqnipment 50 per cent, which makes 150 and then 50 per cent for replacements.

Mr. **Slemp**. Which will make altogether 225 per cent?

Gen. **Dickson**. Yes.

Mr. **Slemp**. Which would give you —— guns instead of ——?

Gen. **Dickson**. It gives you two and a quarter times——

ITEMS COVERED BY DEFICIENCY APPROPRIATIONS.

Mr. **Borland**. General, I notice you have here a credit of $84,061,000, less items submitted to Congress March 8, 1918.

Gen. **Dickson**. Yes, sir; that is in what we call the deficiency estimate. If you will look on the second page of that statement you will find the last five items starred. The sum of those items is brought over here and deducted because we are trying to make this estimate separate and distinct from the amount asked for in the deficiency estimate. In other words, we are going to ask you to appropriate the original estimate and what was in the deficiency as cash, and for this supplemental estimate we are asking a contract authorization only.

Mr. **Borland**. And this $84,000,000 is for five specific items?

Gen. **Dickson.** Yes, sir; we put them in here so as to keep our program complete and yet be sure to take out the allowance that was covered in the deficiency estimate.

INSPECTION, ADMINISTRATION, AND CONTINGENCIES.

Mr. **Borland.** You have one remaining item here, inspection, administration, and contingencies, $212,626,224.

Gen. **Dickson.** Yes, sir.

Mr. **Borland.** How is that money to be employed?

Gen. **Dickson.** That is to pay the cost of the inspection and the administration expenses that are directly chargeable to this appropriation. It covers all kinds of contingencies. For instances, the prices we have used here were prices that we were pretty certain of last year. We know that labor and material, especial labor, is increasing, and we must have money to pay any increased expenses, because they were not included in the unit cost. Then there is another thing, sir. There are some localities in which we have placed orders because there were plant facilities in existence, and the increase in the number of employees has forced us to put up, in a few cases, some temporary houses. The President, I think it was in December, put the housing facilities under the Department of Labor, and a bill was introduced in the Congress authorizing something like $50,000,000. That money has not become available. The Ordnance Department has been negligent in not providing temporary housing for some plants, because it really has been hampering production. We do not like to spend money that you appropriate for manufacturing purposes for housing, but in two or three cases, a few more cases than that, possibly, it was very necessary to do so.

Mr. **Good.** Do you pay out any sums as bonuses for speeding up under any of these contracts for guns or other equipment under this item?

Gen. **Dickson.** I do not personally know of any plant that is doing it—that is, any plant working on a cost-plus basis. Plants that have a flat-price contract may be doing that, but the Government plants and the private plants that are producing on the cost-plus plan are not doing it, I am sure. I know that in the case of the Government plants they are not doing it, and I do not know of a single case where a private plant is doing it.

Mr. **Good.** My recollection is that when the deficiency bill of October 6 was under consideration some provision was put in the bill providing for an extra bonus in cases where the contractors were able to make deliveries in advance of the time specified in the contracts. I think there was some provision of that kind in connection with the ammunition, but I do not know whether there was any with reference to the guns.

Gen. **Dickson.** I think not, sir, and I have not seen that provision. I am not sure it is not being done.

Mr. **Good.** I have been struck with the fact that in the deficiency act of June 15 you got $155,000,000 with $40,000,000 of contract authorization. That, together with $6,900,000 in the regular appropriation act for 1918, with a contract authorization of $2,200,000, was to take care of an army of 1,000,000 men in the field. Then, again, under the deficiency act of June 6 you were given $695,100,000, which was to pay the $40,000,000 contract authorization and provide equipment for a second army of 2,000,000 men.

Gen. DICKSON. For a second army of 1,000,000 men?

Mr. GOOD. Yes; that made an army of 2,000,000 men.

Gen. DICKSON. Yes; that is right.

Mr. GOOD. The total cost of procuring mountain, field, and siege cannon and their carriages for an army of 2,000,000 men at that time was $1,124,200,000. Now you are asking here for practically that amount of money to provide the equipment for an army of 1,000,000 men, which is an increase that is pretty large in percentages.

Gen. DICKSON. As you put it, this last estimate would appear unduly high; but there is a very good explanation for that, namely, that since the other appropriations were made the General Staff has required the motorization of more batteries, which at that time were to be horse drawn; in fact, we did not know whether some were to be horse drawn or motor drawn, so we did not estimate for them. Then, the trench-warfare material has been fixed, and we are asking for a great deal more. Then, this heavy railway artillery has been called for since then. For instance, here is over $117,000,000 for that alone. Since then the automobile-driven repair shops and equipments have been prescribed, and that alone adds $97,440,000. Here is an item for guns that have been transferred from the Navy, amounting to $3,300,000.

Mr. GOOD. But you are not providing for any more guns per thousand bayonets and sabers than you did before?

Gen. DICKSON. No, sir. We are not only asking for the guns and carriages required for the three armies, but we are asking for the motor equipment necessary for three armies that was not prescribed before for the two armies, and we are asking in addition what is required to go with this third army. Then, we are asking for an increase in trench-warfare material to make up the deficiency in the first two armies plus what goes with the third.

Mr. GOOD. You did not have any trench-warfare material in the first two armies?

Gen. DICKSON. We had some, but not as much as we have now; it has been increased. Then the railway artillery has come in; these motor-repair shops have come in and we have these guns from the Navy, which are new; also these proving grounds, which are new, and then this money is asked for paying the remittances to Gen. Pershing. That is all new, you see.

Mr. GOOD. Do these estimates provide for an increase in the cost for any of the material over the estimated cost in the deficiency act of October 6?

Gen. DICKSON. In the case of guns, howitzers, carriages, ammunition, trucks, etc., we used the same prices as before, because we have not any more definite information on costs; we have not had enough production yet to determine the new prices, and we have added in the contingent percentage of the whole enough for what we think would cover that.

Mr. GOOD. In general, has there been any increase in costs?

Gen. DICKSON. Yes, sir.

Mr. GOOD. For material of this kind, since October, 1917?

Gen. DICKSON. Yes, sir; wages have been increased quite materially and it is going on right now.

Col. SIMPSON. One very considerable item in the ordnance program is the cloth necessary for haversacks, cartridge belts, and things of that sort, all of which are made out of cotton duck. I was talking with the cotton expert of the Quartermaster Department to-day and he told me that the cotton duck which we bought last October and November is cheaper per pound now than the cotton itself with which it will have to be replaced in new cloth. We have gotten the finished duck at a cheaper price per pound than the raw cotton itself.

Mr. GOOD. But that is not true of steel products, is it?

Col. SIMPSON. That is typical of what is happening in a good many commodities.

Mr. GOOD. Is it typical of what is happening in the steel industry?

Gen. DICKSON. I would prefer that you ask Col. McRoberts, because he is doing the buying and he is familiar with prices which I am not, but I know about labor, and labor has gone up materially.

Mr. GOOD. General, is it not true that your plan for equipping this third army of a million men is radically different than your original plan for equipping the first army of 1,000,000 men, so far as mountain, field, and siege cannon, including their carriages, are concerned? Including your annual appropriation of $6,900,000 and $2,200,000 of contract authorization, with your appropriations and contract authorizations of June 15, you only had about $203,000,000, whereas in this appropriation you are asking for over $1,000,000,000, in addition to the appropriation to take care of your contract authorizations for the first two armies. That difference of $800,000,000 more than takes care of motorizing the other two armies, purchasing these Navy guns, providing for your repair plants, and things of that kind, so that it must be bottomed on quite a radical change of the program.

Gen. DICKSON. The program on which we are now working, as I remember, was only approved, as to the amount of equipment that was to go to each organization—I do not think it was all settled until about December. I suspect you will find that in the previous estimates the lack of personnel and the rate at which the officers were working resulted in not all of the items being included. Now, we have tried to sweep a clean house this time. There is another thing. Many of the original estimates covered a certain amount of equipment at the estimated cost, but it was necessary to use a good deal of that money in creating plant facilities. For instance, we have, as I remember, nine new gun forging plants, and the equipment in most cases and the buildings——

Mr. GOOD (interposing). That is, since June 15 of last year?

Gen. DICKSON. Yes, sir.

Mr. GOOD. Nine new ones since that time?

Gen. DICKSON. I think that the first of those plants was authorized in July, 1917.

Mr. SLEMP. You only loan the money to those plants, do you not? The Government has no investment except the money advanced on the production of the plants, has it?

Gen. DICKSON. In most cases we are paying for the buildings, the machines, and the full equipment.

Mr. SLEMP. That is simply a loan, is it not?

Gen. DICKSON. No, sir. The contracts provide that at the termination of the war the plants are to be disposed of, and provide a means for doing it, although I think we will have to ask for some special legislation.

Mr. SLEMP. How much money have you invested in the nine Government plants to which you have referred?

Gen. DICKSON. I do not know, but I can get that for you.

Mr. GOOD. General, to what extent have you resorted to the provision contained in section 120 of the act approved June 3, 1916, which gives the President, in time of war, and when war is imminent, the power to commandeer and also require manufacturing concerns to give a preference to the War Department as to all supplies which are thought necessary?

Gen. DICKSON. The Ordnance Department has taken advantage of that law in a number of cases.

Mr. GOOD. Has it been helpful in securing reasonable prices under the contracts?

Gen. DICKSON. I think it has; yes, sir; it has been very helpful to us in getting plants to undertake work also.

Mr. BORLAND. General, how much of your item for inspection, administration, and contingencies is devoted to inspection?

Gen. DICKSON. We set aside 3 per cent for inspection.

Mr. BORLAND. How much does that amount to in this item of $212,626,224?

Gen. DICKSON. About $6,379,000.

Mr. BORLAND. How much do you set aside for administration?

Gen. DICKSON. That is made up of the expenses of procurement, production, and engineering. I think they run, on an average, about 2 per cent each; that would probably make about, as I remember, approximately 7 per cent—between 6 and 7 per cent.

Mr. BORLAND. Procurement, production, and engineering?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Assuming that they run about 2 per cent each, or 6 per cent in all, that would be twice $6,379,000, which would be about $12,758,000. Is that a reasonable estimate?

Gen. DICKSON. I think it will run about 6½ per cent of that.

Mr. BORLAND. Then that would be about $13,820,000.

Gen. DICKSON. That is about; yes, sir.

Mr. BORLAND. That accounts for practically $20,200,000 of the $212,000,000?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. And all the rest is for contingencies?

Gen. DICKSON. Yes, sir; practically all for contingencies.

Mr. BORLAND. How do you estimate that amount for contingencies?

Gen. DICKSON. In time of peace we used to add 10 per cent for contingencies in our estimates, and now we are taking about 9½ per cent out of 25 per cent for inspection, production, procurement, and engineering, and engineering includes experimentation; so that would leave 15½ per cent. Now, in time of peace we used to add 10 per cent. That other 6½ per cent is for unforseen contingencies.

Gen. Pershing is asking for new things frequently, and we may have to spend some more money on additional plants, but we hope not.

Mr. BORLAND. That gives you $192,000,000 as a contingent fund?

Gen. DICKSON. Yes, sir. We added 10 per cent in time of peace and we thought that in time of war it should be a little more to take care of the unforseen things, such as additional plant facilities, and we may have to spend some of this money for temporary houses.

Mr. BORLAND. How much of that would you need in cash? You need some part for inspection and some part for administration. I suppose.

Gen. DICKSON. Take this item that you are now considering for the production of mountain, field and siege cannon, which we call A. of F. "B". In the original estimate that was submitted last fall we asked for $225,000,000 cash to cover the contract authorizations previously made. On March 12 we submitted a deficiency estimate of $84,061,000. The sum of those two is $309,061,000. We would like to have under this item in cash——

Mr. SLEMP (interposing). The $84,000,000 which you submitted as a deficiency estimate in March was never allowed in law, was it?

Gen. DICKSON. No, sir; that has not been appropriated. This supplemental estimate is $1,063,131,119, to which must be added $34,050,000 to cover the mortars that we spoke about and which Gen. Pershing cabled for the other day, and from which can be subtracted the reduction of a little over $32,000,000 that was made in the motor equipment by reducing the 50 per cent to 10 per cent, and then if you do not appropriate for the guns that were obtained from the Navy there is $2,847,000 that can come out of that. The total of the supplemental estimate, which you are now disccussing, plus the $34,050,000 which we are asking for the motors, can all be in contract authorization.

Mr. BORLAND. Then you will not need any cash for this inspection, administration, and contingent proposition?

GENERAL CONTRACT AUTHORIZATION FOR ORDNANCE MATERIAL.

(See pp. 287, 312, 315.)

Gen. DICKSON. Except this: The total of the supplemental estimates under these items is $4,660,229,665, including a general contract authorization of $500,000,000. Now, we would like to get $900,000,000 cash as a general appropriation to cover all these items. That is all the cash we want out of the total supplemental estimates, because you will make another appropriation and adjourn on March 4 next, and that is all the cash we will need from now until March 4, but we do want authority to make these contracts.

Mr. BORLAND. It will be necessary for us to divide that $900,000,000 among these four items?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Armament of fortifications C, armament of fortifications B, armament of fortifications L, and armament of fortifications N, how do you divide that?

Gen. DICKSON. I do not know how to do these things very well, and you know better than I do, but what we suggest is a clause that would give the $500,000,000 general contract authorization and then an appropriation to cover payment under the four items, which would make it easier for us than to try to take $900,000,000 and tell you just how much cash or what percentage of that amount we ought to have under each of these items.

Mr. BORLAND. Of couse, the effect of that would be to make the $900,000,000 available for any one of the four items in any proportion you finally decided you wanted it.

Gen. DICKSON. Yes, sir. In other words, I think we can get along with a smaller sum in cash if appropriated so that we can pay it out under any one of the four items than we could if you tried to fix the amount of cash under any one item, because, while we can figure around and guess pretty closely, we can not always tell, because the contractors under one item may get along faster than we thought and the contractors under others might be slower, so we would not have cash under one item and have a surplus under another which would not be applicable.

Mr. BORLAND. General, of course, that is a question for the committee to go into. It is practically reducing these specific appropriations to a lump sum. Have you not in mind a division that you have made of this $900,000,000? How did you arrive at that in your own mind?

Gen. DICKSON. Well, we really made a survey of what we expected to get and about when we would get deliveries and took a percentage, and we added that up, and then in studying it over further we thought we could reduce the amount if it were made a lump sum.

Mr. BORLAND. How did you figure it out in items? How much cash did you figure out under each item?

Gen. DICKSON. May I submit that to you later?

Mr. BORLAND. Yes, sir; then we can tell whether the $900,00.000 is a reduction in lumping these items together.

Gen. DICKSON. Yes. You understand that that is for all the bills we think will fall due by March 4.

Mr. SLEMP. General, why do you limit this to March 4?

Gen. DICKSON. Because Congress is in session from December to March 4.

Mr. SLEMP. This would be for the next fiscal year?

Gen. DICKSON. That is true; but you have a way of appropriating under a contract authorization which was previously made and making the appropriation immediately available.

Mr. BORLAND. General, your original estimates were $2,889,841,990 and your supplemental estimates are $4,660,229,000.

Gen. DICKSON. Yes, sir.

Mr. BORLAND. I understand you had of the $2,889,000,000, $381,000,000 in your deficiencies?

Gen. DICKSON. Yes, sir: it is the sum of those items, and we want to get the cash for those.

Mr. BORLAND. Why is it not a subtraction?

Gen. DICKSON. Because these were the original estimates, and this came up later, and we asked to have that in addition because they are brand-new projects.

Mr. EAGAN. You have not had that at all yet?

Gen. DICKSON. No, sir.

Mr. BORLAND. That is what you submitted as a deficiency estimate which was not appropriated?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Then, the total of your original estimate and the deficiency estimate submitted in March is $3,271,000,000 in round numbers?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. And you expect all of that in cash?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. And then you expect this $4,000,000,000 of supplemental estimate in contract authorizations?

Gen. DICKSON. Yes, sir; of which $900,000,000 should be in cash.

Mr. BORLAND. Then, the cash you will need is $4,171,000,000?

Gen. DICKSON. Yes.

Mr. BORLAND. And of the supplemental estimate, you suggest that $900,000,000 be appropriated as a lump sum?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. You are familiar with the plan we adopted on the Panama Canal of having 10 per cent of the appropriations for each specific purpose interchangeable?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. That would not fit in here?

Gen. DICKSON. Yes, sir; it certainly would, excellently.

Mr. BORLAND. Why is not that a better plan than the lump-sum plan, having the advantage of already having been approved by the general committee as a general policy?

Gen. DICKSON. Will you let me make a little study about that and work out that percentage?

Mr. BORLAND. Yes. I realize that in all of these manufacturing and construction jobs, which are different from the ordinary activities of the Government, it is impossible for the man in charge to figures down to the last cent a year or a year and a half in advance what he has got to spend, what his labor and materials is going to cost him, and what economies may be effected, and there must be some leeway, and we have ascertained that one of the best ways to provide that leeway is by having 10 per cent of the appropriations interchangeable, which can be done in reference to a construction appropriation, whereas ordinarily we would not do that in the other classes of appropriations.

Gen. DICKSON. I know from actual experience that that was of very material assistance on the Panama Canal.

Mr. BORLAND. General, you have in the column marked "To be submitted" an item of $34,050,000.

Gen. DICKSON. That is for the 12-inch mortars I told you about. We just got a cable last week about them, and we can not finish them unless we get some money.

Mr. BORLAND. And the estimate of $34,050,000 you are now submitting?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. And that is for —— 12-inch mortars, —— railway carriages, —— service cars, together with the plants for manufacturing?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. How is that divided up. How much for the mortars, how much for the railway carriages, and how much for the service cars?

Gen. **Dickson.** —— carriages, $10,200,000; —— mortars, $5,400,000; —— service cars, $3,450,000; plant, $15,000,000, making a total of $34,050,000.

Mr. **Borland.** How does it happen that you estimate for —— railway carriages and for —— mortars; does that mean that you have 50 per cent of spares?

Gen. **Dickson.** Yes, sir; Gen. Pershing has specifically prescribed that in furnishing him with these large guns we must give him two guns for every mount. When we give him a howitzer or mortar we must give him one and a half howitzers or mortars for each carriage, to allow for one to be back for relining.

Mr. **Borland.** As to your plant, do you expect this to be a Government plant?

Gen. **Dickinson.** The Government will have to provide a plant for making these mortars.

Mr. **Borland.** Will they be made in the Pittsburgh plant?

Gen. **Dickson.** That is now under consideration.

Mr. **Borland.** How do you arrive at the estimate of $15,000,000 for the plant?

Gen. **Dickson.** The —— mortars have to be completed in February, 1920. When you make the necessary allowance for the time to construct the plant and build the machines, you subtract that number of months from the number of months available, that is, from now until February, 1920, and dividing that number of months into the number to be made, you have obtained the capacity of your plant, and taking that capacity and comparing it with what other plants have cost in proportion, that is the way we arrived at it.

Mr. **Borland.** Have you made any plans as to the location or the construction of this plant?

Gen. **Dickson.** Not as yet; no, sir. We are working on it now.

Mr. **Borland.** Could it be combined with your Pittsburgh plant?

Gen. **Dickson.** That is under consideration.

Mr. **Borland.** Would it be of the same nature—a plant making steel from the iron, making the forgings and machining the guns?

Gen. **Dickson.** Yes, sir.

Mr. **Borland.** The same general kind of plant?

Gen. **Dickson.** Exactly; yes, sir.

Mr. **Borland.** Would it require $15,000,000 in that case, or would it simply require an addition to that plant?

Gen. **Dickson.** If it were put there it would be an addition to that plant; but, of course, the buildings and machines and everything have got to be provided. It would be economical to construct a separate building for these howitzers, as they are only 20 calibers, whereas the other plant is to take 50-caliber guns, therefore the span of your crane could be much less and your plant would cost correspondingly less.

Mr. **Borland.** Then the cost of the $15,000,000 plant is figured into the cost of the —— mortars?

Gen. **Dickson.** Yes, sir.

Mr. **Borland.** Can you make the railway carriages there also?

Gen. **Dickson.** No, sir; we are planning to do that. We hope to be able to get them out of existing car shops in part, and in part out of existing plants such as plants that are making steam shovels, locomotive cranes, and heavy machinery, although it is possible that some additional equipment may have to be provided for the carriages.

Mr. BORLAND. Then you are going to add to these estimates $61,050,000, making a total of $7,994,000,000 or practically $8,000,000,000. Is that all of the program?

Gen. DICKSON. Up to to-day, sir. If we get another cablegram ordering more material we will have to come to you again.

Mr. SLEMP. General, could you make a little further study of the subject and tell us what amount of these authorizations you would expect to utilize in March, April, May, and June of next year?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. General, I feel we ought to go a little more into this question of how much cash you will need and how much contract authorization. We are, of course, now discussing the item of armament of fortification B, and your original estimate was $225,000,000.

Gen. DICKSON. That was merely to cover contract authorizations previously made in the act of October 6, 1917.

Mr. BORLAND. But your deficiency estimate which you submitted on March 12, 1918, of $84,061,000, and for which you now want cash, appears to be for these five items of the 14-inch guns and railway mounts complete, the service cars, the 16-inch howitzers and railway mounts complete, and the service cars for them, and the two big plants, $40,000,000,000. Now, manifestly, you would not include all of those among your necessary cash items; in fact, it looks to me as though those were not necessarily cash items.

Gen. DICKSON. That $225,000,000 we have got to have right away. Of course, there is no question but what part of that $84,000,000 need not be appropriated for at this time, but what I did was to guess at what would be the minimum amount of cash we could get along with.

I took this deficiency estimate and this supplemental estimate and added them together and looked over the items and picked out what I thought we would have to pay out by March 4. It was so large that I just deducted a certain amount which gave me the sum of $900,000,000. As to the other items, if you would be kind enough to let me take that to-night and go over that I will submit to you at your next meeting a statement about it.

Mr. BORLAND. I wish you would, because we will want to arrive at how much cash you will need in the $84,000,000 estimate just as in the other items.

Gen. DICKSON. All right, sir.

Mr. SLEMP. In one of your items you had $113,000,000 for contingencies, and in that you suggested that it might be possible you would want to build some new plants.

Gen. DICKSON. We may have to add to our facilities.

Mr. SLEMP. What does that mean?

Gen. DICKSON. Well, take the railway mounts. There are —— 14-inch guns, there are —— 16-inch howitzers, and there are —— new 12-inch mortars. Now, we have three plants all working on those railway mounts, on the 8, 10, and 12 inch gun, and some other 12-inch mortars that we took out of the seacoast forts. Now, when we get up to these big calibers they may have to have some additional and larger machines, or we may have to put up a shop in order to get them out on time. That is a pretty big schedule to come through with.

Mr. SLEMP. It is not possible for you to pass on that now?

Gen. DICKSON. No, sir; I could not do that.

AMMUNITION FOR MOUNTAIN, FIELD, AND SIEGE CANNON.

Mr. BORLAND. General, the item "Armament of fortifications C" appears in the bill as the purchase, manufacture, and test of ammunition for mountain, field, and siege cannon, etc. The estimate as we have it is $2,672,000,000. I do not quite make that agree with your estimate under the column of "original estimate, 1919," as it appears on this sheet. Your estimate here is $2,251,500,000.

Gen. DICKSON. If you will look under the original estimate, "Armament of fortifications C," you will find $2,251,500,000; in the deficiency estimate of March 12 there is carried $272,500,000. Now in the supplemental estimate, which you are about to consider, you find $2,701,394,437, with the addition of $27,000,000 more.

Mr. BORLAND. I see that; but where do you get the $2,672,000,000 which appears in our book?

Gen. DICKSON. I do not know why your book should be different from this.

Mr. BORLAND. The sum of your original estimate, as it appears on your sheet under the deficiency estimate of March 12, is $2,524,000,000.

Gen. DICKSON. Yes, sir.

Mr. BORLAND. That does not correspond with the amount given in the book, which is $2,672,000,000.

Gen. DICKSON. If you will give me a chance, I will go into that. This is supposed to be correct.

Mr. BORLAND. It would appear that some items in the original estimate, as furnished to the committee, have been omitted and transferred to the supplemental estimate or something else.

Gen. DICKSON. Would you mind reading how much is in your book?

Mr. BORLAND. The amount in my book, which indicates the amount formally transmitted to the committee, is $2,672,000,000, and that is larger than the sum of your original estimate as it appears on this sheet and your deficiency estimate of March 12. So it would indicate some change in program, which you can probably identify.

Gen. DICKSON. I will try to do so.

Mr. BORLAND. And the original estimate I have is $421,000,000 greater than the original estimate you have.

Gen. DICKSON. I will find out about that and give you a statement, so you will know exactly.

Mr. BORLAND. General, we would like to know how you expect to expend the original estimate. I think you combine the original estimate with the deficiency estimate, do you not?

Gen. DICKSON. No, sir. The original estimate Gen. Rice, I believe, explained in a former hearing.

Mr. BORLAND. No; Gen. Rice went into the seacoast cannon and ammunition for seacoast defenses, but he did not go into this.

Gen. DICKSON. The way we have arrived at this is as follows: The number of rounds per day per gun for every caliber with which we are to furnish the Army has been fixed by Gen. Pershing and has been transmitted by the Chief of Staff to the Ordnance Department. For example, for the 75-millimeter gun we are to furnish — rounds per day for every gun. There are — of the 75-millimeter guns, on an average, in each division. That requires —— rounds of 75-millimeter ammunition for each division for each month. Now, we are not asking you for the ammunition for three armies, or 90 divisions, but we are asking you to provide enough for a total of 54 divisions, because we think that will take care of the ammunition through the calendar year 1919.

Mr. BORLAND. You mean, including the calendar year 1919?

Gen. DICKSON. I mean up to June 30, 1919.

Mr. BORLAND. That is, the fiscal year 1919?

Gen. DICKSON. Yes. That means ——rounds of this 75-millimeter ammunition. Do you want our estimated cost?

Mr. BORLAND. Yes.

Gen. DICKSON. $583,440,000. For the 37-millimeter guns — rounds a day is what we are told we must provide.

Mr. BORLAND. That does not figure in this item?

Gen. DICKSON. That is where we have included it.

Mr. BORLAND. But it is not in the class of Field Artillery, is it? The 37-millimeter gun is below the class of Field Artillery, is it not?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Then, we can not include it here, because this is a different class of field artillery.

Col. SHINKLE. This ammunition is for the 37-millimeter trench gun that is used for destroying pill boxes, and it is classed as artillery ammunition because it is a high explosive shell and is ammunition for this cannon. It is also used in the tanks, and I believe it is classed as field artillery ammunition.

Mr. BORLAND. How does it happen that the gun is not classed as field artillery but the ammunition is?

Col. SHINKLE. It is my impression that this particular gun is classed as mountain, field, and siege cannon, and the one for the automatic gun is not so classed.

Mr. BORLAND. You have not included any gun here under 75 millimeters, have you?

Gen. DICKSON. We have included no 37-millimeter guns in this estimate, but we did include 37-millimeter guns in the Army bill. I think the chances are that we have been buying the guns out of the Army appropriation bill and have included the ammunition in this bill, it being high explosive, and we always get the high explosive out of the fortifications bill.

Mr. BORLAND. I did not suppose they were getting at it in that shape. These particular shells are high explosive shells?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. And you have never used the Army bill appropriation for high explosives, so that we are reaching here a twilight zone, because we have ammunition for a gun that is not included in the item.

Mr. BYRNS. Having estimated for this class of guns in the Army bill is there any possibility that you estimated for the ammunition?

Gen. DICKSON. No, sir; I know what is in that bill.

Mr. BORLAND. How much is the item for that?

Gen. DICKSON. We allow — rounds per day per gun; there is an average of 12 guns in a division, which makes the total required — rounds at a total of $2,563,000.

Mr. BORLAND. Have you ever bought that ammunition out of this appropriation before?

Gen. DICKSON. I have spent some of this money this year in buying this ammunition; yes, sir.

Mr. BORLAND. This is for the purchase, manufacture, and test of ammunition for mountain, field, and siege cannon.

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Now, if this ammunition is not for mountain, field, or siege cannon, how would you be justified in buying such ammunition out of this item?

Gen. DICKSON. I think we would be justified in doing it because there is nothing in that item which fixes the caliber; you are simply fixing the use.

Mr. BORLAND. But the same description is used—mountain, field, and siege cannon—as in the previous item?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. So that what is mountain, field, and siege cannon under the one item is mountain, field, and siege cannon under the other item.

Gen. DICKSON. That is very true, but there is nothing that fixes the caliber, and the 37-millimeter gun, I think, could very properly be classed as a mountain weapon or a field weapon.

Mr. BORLAND. You do not apprehend any difficulty, then, with the auditor?

Gen. DICKSON. Not a bit.

Mr. BORLAND. But you are not able to say whether any of these expenditures have been made in the past?

Col. SHINKLE. I can answer that by saying that the contracts we now have in operation are under armament of fortifications C.

Gen. DICKSON. We issued an order the other day to make some 20-ounce shells and charged them to this appropriation.

Mr. BORLAND. What is the next item?

Gen. DICKSON. The 4.7-inch gun, for which the allowance is ——— rounds a day for the year; that requires ——— rounds ———, making a total of $46,956,000. The 155-millimeter gun is allowed ——— rounds a day; the requirements per year are ——— ———, making a total of $120,900,000. The 155-millimeter howitzer is allowed ——— rounds a day; the requirements per year are ——— rounds, making a total of $585,000,000. The 3-inch Stokes mortar is allowed ——— rounds per day, requiring ——— rounds per year, ———, the total being $19,468,800. The 4-inch Stokes mortar is allowed ——— rounds per day; the requirements of a year are ——— rounds, ———, making a total of $3,900,000. The 6-inch Newton mortar is allowed ——— rounds per day, requiring ——— per year, ———, making a total of $30,712,500. The 3-inch antiaircraft gun is allowed ——— rounds per day; the requirements per year are ——— rounds ———, making a total of $386,100,000. The 240-millimeter trench mortar is allowed ——— rounds per day; the annual requirements are ——— rounds, ———, making a total of $47,580,000.

Now, for what is known as the Army artillery we are estimating for two armies, because as it goes over it will build up gradually, and enough for two armies will carry it through. For the 155-millimeter gun ——— rounds a day is allowed, the requirements being ——— rounds, ———, making a total of $290,160,000. For the 8-inch howitzer there are allowed ——— rounds a day, requiring ——— rounds, making a total of $106,920,000. For the 9.2-inch howitzer there are allowed ——— rounds per day; the requirements per year are ——— rounds, ———, making a total of $54,000,000. For the 240-millimeter howitzer ——— rounds per day are allowed, the requirements being ——— rounds, ———, making a total of $275,400,000. For the 5-inch seacoast guns, ——— rounds per day are allowed, requiring ——— rounds, ———, making a total of $11,340,000. For the 6-inch seacoast guns ——— rounds per day are allowed, requiring ——— rounds, making a total of $53,820,000. For the 8-inch seacoast guns, ——— rounds per day are allowed, requiring ——— rounds, making a total of $62,775,000. For the 10-inch seacoast guns ——— rounds per day are allowed, requiring ——— rounds, making $99,562,500. For the 12-inch seacoast guns ——— rounds per day are allowed, requiring ——— rounds, making a total of $39,600,000. For the 12-inch mortar ——— rounds per day are allowed, requiring ——— rounds, making a total of $112,500,000. For the 4.7-inch antiaircraft guns ——— rounds per day are allowed, requiring ——— rounds, making a total of $12,000,000. That makes a total of $2,946,697,800.

Now, there are certain miscellaneous artillery not included in that, such as 3-inch antiaircraft guns at base depots, 75-millimeter guns, etc., for use in tanks, $14,167,000. Now the sum of those two make a total of $2,960,864,800. We are also asking for the contract authorization in the urgent deficiency act of October 6, 1917, amounting to $777,182,750, making a total of $3,738,047,550. We asked in the October estimate $2,251,500,000, which we subtract from the above mentioned sum, making what we are asking for in the supplemental estimate $1,486,547,550 for the ammunition referred to.

Mr. Borland. That does not agree with your supplemental estimate.

Gen. Dickson. I am not through yet, sir; I have just started on this.

Wednesday, May 22, 1918.

Gen. Dickson. Mr. Chairman, relative to your question about the purchase of the 37-millimeter ammunition out of A. of F. C., I did not think of it at the time, but I thought of it afterwards, under what we call A. of F. N., which is for the purchase, manufacture, and test of ammunition, subcaliber guns, and other accessories. We buy subcaliber guns and also buy the allowance of ammunition fixed by the War Department, and that includes some caliber .30 ball cartridges and some 37-millimeter or 1-pounder ammunition, so we have been buying it out of armament of fortifications.

Mr. Borland. Last night, General, when we concluded, you had just given us the items of the original estimates.

Gen. Dickson. I gave you under the heading, "For the purchase, manufacture, and test of ammunition for mountain, field, and siege cannon, etc.," the total quantity of service ammunition required for 54 divisions for the fiscal year of 1919, which totaled $2,960,864,800.

and added to that the contract authorization contained in the urgent deficiency act of October 6, 1917, of $777,182,750, as that has all been obligated, making a grand total of $3,738,047,550; and then subtracted from that the $2,251,500,000 that was in the original estimate submitted last October, leaving the net amount included in this supplemental estimate of $1,486,547,550. Now there are other items that go to make the total of the supplemental estimate under A. of F. " C.," which other items you did not take up.

Mr. BORLAND. General, where was this $2,251,500,000 submitted?

Gen. DICKSON. In the regular estimates for the year of 1919, last October.

Mr. BORLAND. You have taken, then, the estimate for supplying 54 divisions, according to the program outlined here, and that amounts to $2,960,000,000, and you have added to that the contract authorization under the act of October 6, 1917, of $770,000,000, which you say has all been obligated.

Gen. DICKSON. Yes, sir; for the fiscal year we are in now.

Mr. BORLAND. If it was obligated, why was it not obligated as a part of that big program?

Gen. DICKSON. Because that was required for the fiscal year 1918.

Mr. BORLAND. For the existing army?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. That was a part of the program for the first army?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. That makes a total of $3,738,000,000?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Of that you have submitted estimates of $2,251,500,000?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. And you have now a supplemental estimate of $1,486,547,550 on that particular program?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Then you say you have some further supplemental estimates?

Gen. DICKSON. I have some more item; that is, for the ammunition to be fired against the enemy. We have a number of other items here for which we are obliged to ask you for money.

Mr. BYRNS. General, you spoke yesterday of varying rounds of ammunition required for guns of different caliber. I was interested to know just what is the general policy followed with reference to determining how many rounds you will probably need per day for each gun. How is that arrived at?

Gen. DICKSON. That is furnished to the Ordnance Department by Gen. Pershing.

Mr. BYRNS. Do you know how he arrives at it?

Gen. DICKSON. It is our understanding that he determined the per diem expenditure by using the experience of France and Great Britain. We have obtained, independently of Gen. Pershing, the expenditures of the British and the French; but we are following the allowances prescribed by Gen. Pershing.

Mr. BORLAND. General, state to the committee the items constituting the estimate of $272,500,000 submitted March 12, 1918.

POWDER PLANTS.

(See p. 280.)

Gen. Dickson. The first item is $135,000,000 for two powder plants, one having a capacity of 900,000 pounds per day, at Nashville, Tenn., and the other having a capacity of 600,000 per day, at Charleston, W. Va.

Mr. Borland. $135,000,000 for the two plants?

Gen. Dickson. Yes.

Mr. Borland. How is that amount separated between the two plants?

Gen. Dickson. $87,000,000 and $48,000,000.

Mr. Borland. You are already construcing those plants without having received the money?

Gen. Dickson. Yes, sir; that is right.

Mr. Borland. Under any authority?

Gen. Dickson. Yes, sir; those contracts were made by the Secretary of War.

Mr. Borland. I mean authority of law.

Gen. Dickson. No, Mr. Chairman.

Mr. Borland. You just went ahead?

Gen. Dickson. Yes; we had to have them.

Mr. Borland. As I understand it, the first unit of one of these plants will be ready in July, 1918?

Gen. Dickson. We expect one unit then; yes, sir.

Mr. Borland. That is the Charleston plant?

Gen. Dickson. Yes, sir.

Mr. Borland. So, as a matter of fact, they are pretty far along?

Gen. Dickson. They are.

Mr. Borland. Have you been called on to make any payments on account of them?

Gen. Dickson. Yes, sir.

Mr. Borland. Out of what fund?

Gen. Dickson. Out of the funds previously appropriated for armament of fortifications "C." We do that in this way: We have some contracts under previous appropriations, payment under which will not have to be made until after you pass this appropriation bill. so we are making payments out of previous appropriations that we do not have to pay out until a new appropriation is made.

Mr. Borland. Have you anything there to show how much you have paid out on account of these two plants?

Gen. Dickson. I will supply that information.

Mr. Borland. When do you expect the Nashville plant to be completed or to have any portion of it in operation?

Gen. Dickson. I was told yesterday that they were very confident of one unit coming in in July.

Mr. Borland. That accounts for $135,000,000 of the deficiency estimate?

Gen. Dickson. Yes, sir.

Mr. Borland. What is the rest of it?

Gen. Dickson. There is another item of $15,000,000 for part of another powder plant.

Mr. Borland. Are we not going to have a tremendous capacity for powder before we get through?

Gen. Dickson. Not more than is necessary to meet the requirements.

Mr. BORLAND. You mean to meet all the requirements of the war all at one time?

Gen. DICKSON. No, sir; to meet it along practically from time to time.

Mr. BORLAND. That accounts for $150,000,000 out of $272,000,000?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. What is the rest of it?

Gen. DICKSON. The next item is $40,000,000 for the construction of nitrate plant No. 2.

Mr. BORLAND. Where is nitrate plant No. 2?

Gen. DICKSON. It is at Muscle Shoals about, as I remember 3 miles from plant No. 1.

Mr. BORLAND. What particular process is carried on in that nitrate plant?

Gen. DICKSON. I would prefer to have Col. Joyes answer your questions as to the nitrate plant, because he is an expert.

WEDNESDAY, May 22, 1918.

STATEMENTS OF COL. J. W. JOYES AND LT. COL. W. C. SPRUANCE, JR.

NITRATE PLANTS.

(See pp. 267, 277.)

Mr. BORLAND. Colonel, you are the nitrate expert of the Ordnance Department, are you?

Col. JOYES. I would not call it that, no; but I have had charge of the nitrate propositions.

Mr. BORLAND. We have been depending so far upon the sodium nitrate from Chile?

Col. JOYES. Yes, sir. There are some other sources for nitrogenous materials, but Chile nitrate predominates. We have been considering the proposition of getting more nitrogenous material out of by-product coke ovens.

Mr. BORLAND. How much sodium nitrate have we on hand and what are our present receipts?

Col. JOYES. That matter has not been under my jurisdiction, but I can speak from general knowledge. * * *

Mr. BORLAND. Is our stock of sodium nitrate used also as a fertilizing material?

Col. JOYES. In normal times a considerable proportion of imports is used for that purpose; yes, sir. Now, I believe, the proportion is very small.

Mr. BORLAND. You are speaking of the stock that is available for use by the Government?

Col. JOYES. I am speaking about the stock that was in the hands of the Government, the Army and the Navy, as well as private explosive and fertilizer people in so far as I had heard. These would in emergency be all available for Government use.

Mr. BORLAND. How much are we receiving from Chile?

Col. JOYES. That I do not know exactly at the present moment. That is not directly in my hands, and I have not first-hand information. Perhaps Col. Spruance can tell you better about that.

Mr. BORLAND. Did we not accumulate a stock of sodium nitrate after the declaration of war and prior to our entrance into the war?

Col. JOYES. We had a small amount. * * *

Mr. BORLAND. Prior to the time we entered the war did we not make an effort to accumulate a supply of nitrate?

Col. JOYES. I know of two cargoes that came in for the Ordnance Department of the Army prior to our entrance into the war, as I was in charge of its storage for about a year and a half. As I say, I know of two cargoes, and that would be about 7,000 tons, I should say. I have not full information as to how much more was purchased. * * * From the time of the commencement of the European war the market was very much upset and prices were very high. A good deal of the nitrate that might have been put upon the market, due to the inability to get it to Germany, was tied up very tightly by the Germans.

Mr. BORLAND. What is sodium nitrate costing us now?

Col. SPRUANCE. The price is 4.25 cents at Atlantic ports and 3.85 cents at Pacific ports. That is practically a fixed price.

Mr. BORLAND. Per pound?

Col. SPRUANCE. Yes, sir; per pound.

Mr. BORLAND. That is about $85 a ton, between $75 and $85 a ton; is that it?

Col. SPRUANCE. Yes, sir.

Mr. BORLAND. Even at that rate it is the cheapest supply of nitric acid there is, is it not?

Col. **Spruance.** Yes, sir.

Col. **Joyes.** I would not say that, but it has been about the only method of obtaining nitric acid in the country because nothing else has been developed, but it is expected that that will be beaten. I believe we could take even the arc process, if we had the necessary amount of power, even at a higher price for power than has ever been considered at all feasible from a commercial standpoint, and make nitric acid to beat the Chile nitrate process when prices are as high as now. The Chile nitrate process, at present prices, would give nitric acid at somewhere around $160 or $170 a ton.

Mr. **Borland.** That is, the Chilean nitrate?

Col. **Joyes.** That is making it from the Chilean nitrate; yes, sir.

Mr. **Borland.** And you expect to beat that?

Col. **Joyes.** We could beat that; yes, sir. The plants that we now have in contemplation are not intended to make strong nitric acid—that is, nitric acid suitable to go into a powder factory. They are to make nitric acid, but only weak nitric acid, and use it right up in making their ultimate product, ammonium nitrate.

Col. **Spruance.** I understood your question to be as compared with any other available source.

Mr. **Borland.** Yes.

Col **Spruance.** Nitrogen from the atmosphere will beat the Chilean nitrate in cost at present prices, but I understood your question related to the present available source.

Mr. **Borland.** Yes. Now, in the national defense act of June, 1916, there was an appropriation of $20,000,000 with which to provide a nitrate supply within this country, and under that a nitrate supply committee was formed, headed by Gen. Crozier, Admiral Earle, and several other gentlemen. One member of that committee was Dr. Parsons, of the Bureau of Mines.

Col. **Joyes.** Yes, sir.

Mr. **Borland.** Dr. Parsons went to Europe and endeavored to find out where the Germans were getting their nitrate, and he filed a report with which I suppose you are familiar.

Col. **Joyes.** Yes, sir; I have it here, sir.

Mr. **Borland.** And you are familiar with the recommendations of the committee following that report?

Col. **Joyes.** Yes, sir.

Mr. **Borland.** I gathered that it was the intention of Congress when it passed that $20,000,000 appropriation to secure a supply of nitrate by atmospheric fixation and that that was a very cheap and available form of collecting it. I gathered from reading Dr. Parsons's report that Germany had had water power in Norway for many years, and the cheapest and most effective water power in the world, probably, but had abandoned it as a commercial proposition and was now making its nitrate by another process, which is evidently better and cheaper.

Col. **Joyes.** No, sir; I do not take it to mean exactly that. The plants in Norway, where they had this very cheap and very abundant water power, were making nitric acid and combining it with lime to make a calcium nitrate. They were doing it very successfully and very cheaply. There were German interests involved in that, and I think the greater part of that product went to Germany. I do not know of any reason why that was abandoned, except for the difficulties of getting it over to Germany during the war. Under the arc process, which is what they have reference to there, the acid produced is very weak—from 30 to 35 per cent of nitric acid combined with 65 or 70 per cent of water—and if that were to be used for powder making you would have to concentrate it; and if you were going to use it, even as a weak acid in many other explosives, it would be practically prohibitive to transport it. If you put it into any metal container that can be manufactured reasonably it would eat its way right through in the matter of hours. The strong acid, mixed with sulphuric acid, can be transported in an ordinary iron tank. In making that weak acid, as they did with the arc process in Norway, the only way they had to send it about was to make a salt of it. Calcium nitrate was the easiest one they could make, so that they made it into calcium nitrate, and that was used as a fertilizer. If you wanted to use it for any explosive work you had to go through another process to make nitric acid out of it. I believe it was principally because of the difficulties of transportation between Norway and Germany after the war commenced that there was a change in program as to those plants in Norway.

Mr. BORLAND. But Germany abandoned the making of nitric acid by hydroelectric power before the war began, according to this report?

Col. JOYES. That was for commercial reasons. Germany has not cheap enough water power for the arc process. Germany uses the cyanamid and Haber processes.

Mr. BORLAND. And since the war began she has evidently produced a very large and abundant supply of nitrates by some other method.

Col. JOYES. By other methods; yes, sir; by other fixation methods.

Mr. BORLAND. You say other methods than atmospheric fixation methods?

Col. JOYES. They are all atmospheric fixation methods, so to speak, and the arc, cyanamid, and the synthetic processes are all called that. The arc process is one where the nitrogen and oxygen in the air are made to combine directly.

Mr. BORLAND. Is that process carried on by hydroelectric power?

Col. JOYES. Yes, sir. Well, electric power must nearly always be hydro, but steam electric power is just the same if you can make it cheap enough.

Mr. BORLAND. Germany has no hydroelectric power within her confines to amount to anything?

Col. JOYES. No. I think there are some few plants in Germany which are run by some hydroelectric power, but most by steam power. There is also the cyanide process. When sodium carbonate, ground coke, or carbon in any form in contact with finely divided iron are heated to redness and nitrogen or even air passed through the mass, nitrogen in quantity is fixed as sodium cyanide. Then, there is the Haber process, so called, a synthetic process wherein ammonia is made by the direct combination of nitrogen and hydrogen.

Mr. BORLAND. The Haber process, which seems to have been commercially installed in Germany in 1913, is now used to a very much larger extent.

Col. JOYES. Yes, sir.

Mr. BORLAND. And that produces ammonium sulphate?

Col. JOYES. Well, it produces directly ammonia, and that is the synthetic process. Sulphate may or may not be made from it.

Mr. BORLAND. The great advantage of that particular process is easy availability of the product for transportation?

Col. JOYES. Yes, sir; ammonia is easier to transport than acid.

Mr. BORLAND. If you have powder plants scattered all over the country, to which you must transport it, it is cheaper, is it not?

Col. JOYES. Ammonia is not used for powder, but may be transformed into acid after transportation.

Mr. BORLAND. You have the transportation proposition with nitrate under any circumstances, but if you make nitric acid by the arc process you say it is very difficult to transport it until you put it through another synthetic process?

Col. JOYES. Yes, sir. If you make it by the arc process and want to make it directly into strong acid and use it at your powder factory you must make the strong acid and transport it in iron tank cars across to your powder factory immediately and use it directly in that form.

Mr. BORLAND. Suppose you have your powder factories established all the way from Nashville, Tenn., to New Jersey and Delaware?

Col JOYES. The fact that you must ship the material and have not the factories located near enough is one reason why we have not any arc processes.

Mr. BORLAND. The report says:

> The cost of nitric acid, per se, whether as weak nitric acid or as concentrated nitric acir, is lowest by the arc process with hydroelectric power.

Col. JOYES. If the hydroelectric power is cheap enough.

Mr. BORLAND (reading):

> Is lowest by the arc process with hydroelectric power delivered to the furnace at a cost of $10 per horsepower-year, or less.

Col. JOYES. Yes, sir.

Mr. BORLAND. That is based on the fact that you are getting the hydroelectric power at $10 per horsepower or less?

Col. JOYES. Yes, sir.

Mr. BORLAND (reading).

> The difficulties of its transportation, the large amount of power required, and other economic reasons, as already explained, make the arc process inapplicable to American conditions.

Col. JOYES. Unless we find some way to change conditions or discover new conditions that we have not known about. At the present moment, with Chilean nitrate at 4 cents or a little over per pound, the nitric acid would cost you, in the normal and usual way, at least $160 a ton, and we could make acid by the arc process and concentrate it for that figure, with power at something over $10. I would not hesitate to undertake it at $20 per horsepower, in competition with Chilean nitrate at present figures.

Mr. GOOD. Then, what could you produce it for by using the $10 horsepower?

Col. JOYES. Strong nitric acid, using $10 horsepower—I have not the direct figures on that, sir, but probably under $100—$100, possibly, would be a fair cost.

Mr. BORLAND. He says, again:

> In spite of these manifest advantages, however, it appears to be the general opinion of the European engineers with whom I came in contact that even with the cheap horsepower enjoyed by the Norwegian plants, they might have had

> to discontinue their operations except for the stimulus given by the present European war. Even as it is, the Norsk Hydro Co., operating the arc plants at Notodden and at Rjukan, has been obliged to install large ammonia-producing plants in order that they might convert their nitric acid to ammonium nitrate and thus render it transportable to markets where it was needed. The cost of horsepower used for the production of nitric acid in Norway is less than $5 per horsepower-year.

Even with horsepower at $5 they would have had to abandon their operations if it had not been for the stimulus of the present European war.

Col. **Joyes.** But look at the geographical location of Norway. She has no market in her own country for what she produces.

Mr. **Borland.** But she has a good market considering the size of the country. She has a good market approximately just as close as we have a good market, considering the size of the country, because she just crosses the Baltic, and that is all. Now, he says:

> However, the low cost of producing nitric acid by the arc process is outweighed by so many other disadvantages that, in my opinion, the process is entirely inapplicable to the uses of the United States Government, and this opinion appears to be shared by all who have given careful thought to the subject. The cost of installing the arc process is high and it involves the use of an amount of horsepower that seemingly is not available on the American continent within reach of the points where the nitric acid would have to be used.

Col. **Joyes.** From what Dr. Parsons had in sight when he wrote that report, he was entirely justified in it. I have never been convinced that there were not some possibilities for the arc process, but I have never been able to work any up, although I have tried hard. There are some places where powers might be developed, and we might get a power which would not be at all approaching those figures in cost, but, perhaps, might run $30 or $40 per horsepower a year. I believe that under certain circumstances and with improvements in the process, which we have some hope of seeing, the arc process might still come to be worth something. The thing that has struck me particularly about the arc process has been the fact that it might offer opportunities of a rather more rapid emergency construction, and I have been studying it with that end in view rather than anything else.

Mr. **Borland.** Just emergency construction?

Col. **Joyes.** Yes, sir.

Mr. **Borland.** He says here, further:

> The great difficulty that has faced the Norwegian plants from the beginning, namely, a market for their products, would in peace times be a serious obstacle to the operation of a large arc plant in the United States. An arc plant at its best involves the use of 2.33 horsepower-years per ton of weak nitric acid. This means that a water-power development of at least 50,000 horsepower would be necessary for the peace requirements of the Government, and a development of 440,000 horsepower would be required for war purposes. These figures are minimum figures on the basis of the relatively high efficiency reached in Norway. No installation should be considered by the Government of less than 75,000 horsepower for peace requirements or 550,000 horsepower for war requirements. If the arc process is to be used, it would also be advisable to arrange for the production of explosives at the point where the arc plant was located. This would, of course, involve the transportation of all other raw materials needed, such as benzol, toluol, alcohol, acetone, glycerine, sulphuric acid, cotton, and other materials too numerous to mention, to the plant and the transportation of the finished explosives therefrom to the place of consumption. As these materials are highly combustible and, for the most part, carry high

> freight rates, it has been found necessary the world over to locate the plants intended for the production of munitions near to the point where the munitions are likely to be consumed. An arc plant of sufficient size to meet the requirements of the Government in time of war would probably have to remain idle, for the main part, during times of peace, owing to the difficulty of disposing of the nitric acid that the plant would produce if in operation. On account of the large amount of horsepower required and the consequent extent of the necessary plant and power-absorption capacity, the cost of installing an arc plant to meet the war-time requirements of the Government would be several times the total appropriations made for the purpose by Congress.

He gives two difficulties there, upon which I would like to have you enlighten the committee. One is the fact that we would need over 500,000 horsepower in one place in order to operate the arc process for war purposes, and that four-fifths of it would be absolutely useless in time of peace, and the second is that you would have to get that at less than $10 per horsepower to beat the other processes. Then there is the other question, that you would either have to take all of your materials to the place where your horsepower was and ship your explosives from there or you would have difficulties in transporting the nitric acid to the place where you needed it.

Col. Joyes. Well, Dr. Parsons was all right in his statement there. He figured on 540,000 horsepower, which would give about 180,000 tons of acid, which was what was being figured on as the war-time needs of the country. It is away above that now. He took 20,000 tons, I think, for the peace-time consumption. Those figures were applicable to the period before the war, but I think they are bound to increase very largely after the war; certainly they will increase in the uses for fertilizer. But how much that is going to be offset by a decreasing production of explosives it is hard to say. Of course, there probably would not be any military explosives made for several years after the war; that is quite likely; and the commercial explosives will not be very heavy, and that may offset the increase in fertilizers. It depends altogether on the question of labor supply for the farms and the cheapness of the product to the farmer. If he gets it cheaper, he will use more of it, and use more of it as he gets educated up to it, undoubtedly. I do not know that I caught quite the point of your question, Mr. Chairman.

Mr. Borland. You said a few minutes ago that you still had hopes for the arc process. I was calling your attention to what Dr. Parsons had said as to its manifest disadvantages and how it was inapplicable to this country.

Col. Joyes. The arc process, as it is known to-day, has an efficiency of about 3 per cent; that is about the usual way of considering it. It has opportunities for great improvement and there is some experimentation going on right now and a number of projects for very radically improving it. In the arc process you burn the nitrogen of the air in an electric arc, and the reaction is a very delicate one. There is so nearly a chemical equilibrium there that if you keep the resulting gas anywhere near the temperature where the nitrous oxide forms it dissociates immediately, and that requires very delicate handling, and then you have a very dilute gas mixture of NO in air, and you have to solve the problem of building that NO up to NO_2, put on another atom of oxide, and then absorb that in water, which gives you the nitric acid; and when you accomplish a certain amount of the absorption in water you liberate some more NO, and that has to go through the same cycle of building up to NO_2, and then absorb that in water, and then you go over that same process over and over again. You can never pick these changes out separately, but they take place indiscriminately in the towers. There have been several propositions, such as running excess oxygen into the towers and sometimes taking the gas and bringing it into a large empty tower, where it is just allowed to sit for some time to allow the oxidation to proceed, and then pass it through the water towers, and so on. The towers for the arc process or for any absorption plant to make nitric acid from the oxygen are very enormous things.

Mr. BORLAND. The whole plant is an extensive one?

Col. JOYES. Yes, sir; and the towers have to be of special construction; but the point as between the arc process and any other process is that you have got to have the towers anyhow to make nitric acid out of ammonia, just as you have to have them to make it by the arc process, but they are not quite such big towers.

Mr. BORLAND. Do you agree with Dr. Parsons that to meet our war-time requirements we will require over 500,000 horsepower?

Col. JOYES. No, sir; it will require very much more than that.

Mr. BORLAND. Where could that be gotten?

Col. JOYES. It could not be gotten anywhere that I know of. There are several possibilities. For instance, if the Niagara Falls were sacrificed, they could be made to give 2,000,000 horsepower, probably.

Mr. BYRNS. You can get more than that at Muscle Shoals, can you not, Colonel?

Col. JOYES. The figures on the Muscle Shoals development indicate something less than 100,000 horsepower continuously.

Mr. BYRNS. I thought it was between six and seven hundred thousand.

Col. JOYES. I know they have said that at times, but I am speaking now, of course, of a single dam, and the abnormal low flow of the river, I think, would bring that down to somewhere below 100,000 horsepower.

Mr. BORLAND. In hydroelectric power you have to take into consideration the lowest normal flow of the river?

Col. JOYES. If you have no steam relay.

Mr. BORLAND. And no storage?

Col. JOYES. Yes, sir. Of course, in all these hydroelectric propositions, they try to have a steam relay there, a steam plant as efficient as possible, which they hold in reserve, and they operate it during the comparatively short periods of the year when the water is not used. So that by spending a small amount of money on coal they are able to sell a great quantity of power as continuous power.

Mr. BORLAND. How about the power on the Mississippi River? How much is the aggregate of power there?

Col. JOYES. I have not the slightest idea, sir.

Mr. BORLAND. No suggestion has been made about establishing an arc process there?

Col. JOYES. Any one development along the Mississippi River would be subject to exactly the same conditions I have mentioned; that is, at the low-water period you would get very little power out of it.

Mr. BORLAND. The Mississippi River would have more constant power than any source we know of.

Col. JOYES. No, sir; Niagara is better, because of the large storage in the Great Lakes. The Mississippi has a large flow of water, but it has a very small fall. At any one particular development you would get very little head.

Mr. BORLAND. I had in mind the Keokuk Dam. That is more constant than any other waterpower development we know of in this country.

Col. JOYES. Yes; but that has a great many fluctuations also.

Mr. BORLAND. But it is more constant than any other we know about.

Col. JOYES. The Niagara is probably better than that, because it has that large lake reservoir behind it.

Mr. BORLAND. If you are familiar with it, I wish you would explain to the committee what has been done in carrying out the recommendation of the Nitrates Supply Committee.

Col. JOYES. In the first place, we have started to build a plant which we know as the United States Nitrate Plant No. 1, at Sheffield, Ala.

Mr. BORLAND. What process are you going to use there?

Col. JOYES. The General Chemical Co.'s synthetic ammonia process.

Mr. BORLAND. Where do you get your ammonia?

Col. JOYES. We make the ammonia.

Mr. BORLAND. Out of what?

Col. JOYES. Out of nitrogen and hydrogen.

Mr. BORLAND. You do not make it out of the air?

Col. JOYES. The nitrogen comes from the air and the hydrogen from water. There are other products, raw materials, that have to go into the process to help it along.

Mr. BORLAND. What process is that called?

Col. JOYES. That is called the General Chemical Co.'s synthetic process. It was worked up by a Norwegian named Mr. de Jahn, employed by the General Chemical Co. That is on page 17 of the pamphlet.

Mr. BORLAND. Mr. Parsons recommends first:

> The Government should obtain its nitric acid by the oxidation of ammonia. It should begin the erection of an ammonia oxidation plant of moderate capacity at an early date in order to train men and obtain experience in the most efficient method of procedure.

Is that the method you are speaking of?

Col. JOYES. Yes, sir; that has been done. If you want to take up those recommendations in order, we might just as well do that.

Mr. BORLAND. Well, give them in your order. I just wanted to know the one you were speaking of.

Col. JOYES. The real recommendations that we worked upon were the recommendations of the Nitrates Supply Committee, on page 6 of that pamphlet. Dr. Parsons's recommendations were not finally approved exactly as he put them in.

> The committee, appreciating the offer of the General Chemical Co., recommends:
>
> 1. That the Government enter into negotiations to acquire the rights to use the synthetic-ammonia process of that company.

2. That, contingent upon satisfactory arrangements with the General Chemical Co., out of the $20,000,000 nitrate-supply appropriation, such sum as may be needed, now estimated at $3,000,000, be placed at the disposal of the War Department, to be used in building a synthetic-ammonia plant.

That we proceeded to do, sir, and that is the United States Nitrate Plant No. 1, at Sheffield, Ala.

Mr. BORLAND. How much was expended in that plant No. 1?

Col. JOYES. The ammonia plant we are expecting to cost us about eight and a half million dollars altogether. An estimate appears here of $3,000,000. That was a very broad estimate, made without any calculations at all, and not brought up to the conditions that actually existed when we built; and it was not for a complete plant. It was based upon figures that the General Chemical Co. made for installing the process on a small scale at one of their plants which they maintain for other purposes, where they had the land and a number of other accessory utilities.

Mr. BORLAND. For my own information, Colonel, do you not have to start with ammonia in that process?

Col. JOYES. No, sir; that is your product, in so far as the General Chemical Co. process is concerned.

Mr. BORLAND. This refers to the oxidation of ammonia, which seems to indicate you start with ammonia.

Col. JOYES. That is another thing. Dr. Parsons stated we should obtain our nitric acid by the oxidation of ammonia. When that was brought before the committee the committee rearranged the sequence of its recommendations a little bit, and they first recommended that we start in and build this General Chemical Co.'s process plant to try out their process for making ammonia, and then later on in their recommendation No. 3 they recommended a plant for the oxidation of ammonia to nitric acid and the concentration of nitric acid to such a strength as would be required for powder. That was on an experimental, manufacturing scale, not big enough to meet any of the needs of the Government at all.

Mr. BORLAND. How much did you say you had invested in that plant?

Col. JOYES. It will cost about $8,500,000.

Mr. BORLAND. Then it will take another plant for the oxidation of that ammonia to convert it into nitric acid?

Col. JOYES. Yes, sir; we are building that plant now for the oxidation of as much ammonia as is needed, about 55 per cent of that, and for carrying that through to produce ammonium nitrate as the ultimate product of the plant. We are expecting that to cost something less than $3,000,000 more, making a plant of about $11,000,000 or $11,500,000, complete, to produce about 22,000 tons of ammonium nitrate per year.

Mr. BORLAND. How many tons of nitric acid is that?

Col. JOYES. In the first place, we make 60,000 pounds, 30 tons, of ammonia per day. We take a little over half of that and convert it into nitric acid, combine that with the balance of the ammonia, and we get, roughly speaking, about 120,000 pounds of ammonium nitrate per day, or 22,000 tons per year. As to the amount of acid, the amount of ammonia made in that plant if all converted into nitric acid would give about 90 tons per day, if it was all converted. As matter of fact, we make about 45 tons.

Mr. **Borland.** How much nitric acid do you need per day altogether?

Col. **Joyes.** For the explosives program?

Mr. **Borland.** Yes.

Col. **Joyes.** I do not believe I have the figures in my mind now. At the time these figures were being made by Dr. Parsons they assumed they would want about 180,000 tons per year, which would be about 600 tons per day.

Mr. **Borland.** Do you count 365 days in a year?

Gen. **Dickson.** About 300.

Col. **Joyes.** Of course, we aim to run every day in the year, but we will lose some time, probably, by accidents, etc.

Mr. **Borland.** So you would have a capacity of between 27,000 and 30,000 tons a year?

Col. **Joyes.** Yes, sir.

Mr. **Borland.** And Dr. Parsons figured 180,000 tons as your war-time requirement?

Col. **Joyes.** Yes, sir.

Mr. **Borland.** Do you agree with Dr. Parsons on that figure?

Col. **Joyes.** No, sir; I never did. I thought at that time it was rather low. That figure of 180,000 tons was given to the committee along in 1916, and as we got the experience of the European war we saw that was very much too small, but it was thought best to let all the recommendations of the committee go along, based upon the same fundamental basis, so that I do not think they were ever asked to revise any programs due to the experience of the war having shown so much more was needed.

Mr. **Borland.** Colonel, how much power do you use at the Sheffield plant?

Col. **Joyes.** It is a new process, and we do not accurately know, but we have put in altogether 5,000 kilowatts capacity.

Mr. **Borland.** How much horsepower?

Col. **Joyes.** That would be a little over 6,000 horsepower.

Mr. **Borland.** Is the plant in operation?

Col. **Joyes.** It is just beginning to come in. We have made a little of the preliminary gas mixture, but we have not purified it or made any ammonia whatever. The apparatus is not all installed for that. We expect to make some ammonia, possibly, in June, and in July we hope to have some ammonium nitrate, not much; we do not promise very confidently, because the process is so new that we know we must have some preliminary experimentation period.

The process has never been worked on this scale before, and it naturally requires some trial to tune up everything and get everything going in harmony. We may find some difficulties that will have to be overcome. It is going to work, there is no question about that; but whether we can make it come into full, harmonious running operation in two months or four months is something nobody can say.

Mr. **Borland.** Your plant is now operated by steam power altogether?

Col. **Joyes.** Yes, sir. You see, the power requirement is a very small item.

Mr. **Borland.** Is it expected that the power will ultimately be furnished by the Muscle Shoals Dam?

Col. JOYES. For that plant it would hardly be worth while to take power from the Muscle Shoals Dam, although it might. We have to have in that process a great deal of steam, anyhow, for heating purposes, etc. We have to have that steam whether we have electric power or not, and when you are running a pretty good-sized steam plant, the economies in producing a little bit more steam offset a good deal of the saving in buying electrical power.

Mr. BORLAND. So you do not count on using the power from Muscle Shoals?

Col. JOYES. To some extent, possibly.

Mr. BORLAND. But you do not regard it as a necessary factor?

Col. JOYES. Not at all, sir.

Mr. BORLAND. Was that a factor which figured in the location of the plant at Sheffield? I understood from some of the parties interested that the plant was put down there and was to be run by steam until they could get their water power developed, and then it was to be run by water power. Was that factor taken into consideration?

Col. JOYES. I think that had some weight in the choice, because the plant was an experimental plant pure and simple, and might have large and varied additional processes. We bought a considerably larger tract of land than we needed for that one plant, and went into everything with the expectation that the plant would be a logical one to expand and try out other processes as well. Then, of course, for those processes there would be an advantage in having a cheap water power close by. I would like very much—in fact, I think we have an item before you now for a reasonable amount of money for an arc plant to be put down there.

Mr. BORLAND. That is what I am talking about now, and that is why I was asking about the arc process.

Col. JOYES. That would not be with the expectation that an arc plant put down there now with the power conditions such as we could now obtain would give anything like a large supply of nitric acid or any other product of use in the war. It would be, on the face of it, an experimental plant. As I told you, we have great hope of some processes to improve the old arc process, and the only way we can try them out is to have the apparatus set up on a commercial scale: that is, the smallest units of the different types we can put together on the ground and work.

Mr. BORLAND. Colonel, is this a very prudent time to try them out?

Col. JOYES. No, sir; it is not, because it is about three years too late.

Gen. DICKSON. But the point is this, Mr. Chairman, although it is late to start in, we had better do it and do it quick, because if we lose the supply of niter from Chile then we are down and out.

Mr. BORLAND. It may not follow, General, that we are down and out if we have not that particular process, because there are other processes that can be followed.

Gen. DICKSON. The arc is the quickest one you can put in, as I understand it, and if you lose your supply of niter from Chile you have got to act quickly or else your manufacture of explosives is going to drop right off.

Mr. BORLAND. The arc process is the quickest one to put in if you are dependent entirely upon steam power; but suppose you are dependent partially upon the development of hydroelectric power, then the reverse is true and it is the slowest process.

Col. JOYES. Yes, sir.

Gen. DICKSON. But the idea is this: You spoke about Keokuk. The department has felt it would be preferable to keep away from Keokuk and leave that for use in case we have to manufacture by the arc process. You there have considerable power that is almost entirely used for commercial purposes, which you would have to shut off——

Mr. BORLAND. If we were driven to it we have got Niagara Falls.

Gen. DICKSON. That is true.

Mr. BORLAND. If we absolutely had to have power and had to sacrifice something to get it, we could sacrifice the Falls.

Gen. DICKSON. Yes, sir; and our idea is to develop the arc process and then if such an emergency arises, we can jump right in there.

Col. JOYES. There is another phase of that particular discussion that is very important to my mind. If you need a very large development of the nitrogen fixation process, the installation time and expense for any of the other processes, such as the synthetic or the cyanamid that are now known and going, are enormous, and if you have a process which requires a comparatively small building cost and a comparatively short time for construction and one which can be put up in a number of different places, such as the arc process, it may use blocks of power such as reserve power or off-peak power wherever you can find such. Now, there are large blocks of power that are idle in this country, but they are not blocks of continuous power where you could put up a going concern and expect to run it 365 days in the year and 24 hours a day, as you must for commercial work. But if you were hard enough put to it you could start running the idle steam plants, such as the steam plants now held in reserve simply to protect the Interborough, and like systems, you could start them up and get the power.

It is going to cost money, but you can get it, and that is the thing that we are liable to come to. In the first place, your production of Chilean nitrate is limited. * * *

Mr. **Good**. How is that produced?

Col. **Joyes**. There are deposits in the very arid country down there and they dig up the earth—it is open-cut mining—and then that earth has to be washed and leached. It contains somewhere in the neighborhood of 13 or 15 per cent of the real sodium nitrate, and that has to be leached, purified, and the resulting product has to be concentrated again and dried out in a dry form. All of that takes fuel, and fuel, by the way, is shipped into Chile, some from this country and some from other countries. It is mostly oil fuel.

Mr. **Borland**. What is the nature of the other nitrate plants?

Col. **Joyes**. The nitrate plants Nos. 2, 3, and 4, which are being built are all similar to No. 1 in that they produce, first, ammonia, but they produce it by an altogether different method. They produce it by the cyanamid method—that is, first making carbide, then calcium cyanamid, and then ammonia by steaming the calcium cyanamid—and then, from the ammonia they proceed exactly along the same lines as in plant No. 1—that is, the ammonia must be oxidized to get nitrous oxide, and that is absorbed in water to make nitric acid, then the nitric acid, weak, say, 50 per cent, is mixed with the ammonia, which gives ammonium nitrate.

Mr. **Borland**. That is the process you acquired from the General Chemical Co.?

Col. **Joyes**. No, sir; it was the synthetic method of producing ammonia that we acquired from them.

Mr. **Borland**. How about the cyanamid method? Did you have to acquire that from them or did anybody have any rights in it?

Col. **Joyes**. That is owned by the American Cyanamid Co., and the American Cyanamid Co. formed the Air Nitrates Corporation and licensed it to build the plants and to operate those plants for us under contract.

Mr. **Borland**. Where is plant No. 2?

Col. **Joyes**. At Muscle Shoals, about 3 miles from Sheffield.

Mr. **Borland**. What is its capacity?

Col. **Joyes**. About 110,000 tons of ammonium nitrate per annum.

Mr. **Borland**. What is its capacity in nitric acid?

Col. **Joyes**. It does not make any as the ultimate output.

Mr. **Borland**. What becomes of the ammonium nitrate?

Gen. **Dickson**. That is a high explosive which is used in certain percentages with T. N. T. as a shell filler.

Mr. **Borland**. Then you do not have to reduce it to nitric acid at all?

Gen. **Dickson**. No, sir. We are using these plants in a measure, that is, Nos. 1, 2, 3, and 4, to produce ammonium nitrate, which is a high explosive.

Mr. **Borland**. What was the cost of No. 2?

Gen. **Dickson**. $40,000,000.

Mr. **Borland**. Where did you get that money?

Gen. **Dickson**. We are asking you for it now.

Mr. **Borland**. You have not gotten it yet?

Gen. **Dickson**. No, sir.

Mr. **Borland**. How far along is that plant?

Gen. **Dickson**. It is pretty well along.

Col. **Joyes**. The greater part of the steel is up.

Mr. **Borland**. When do you expect to have it in operation?

Col. JOYES. It will begin production the latter part of August or the first of September.

Mr. BORLAND. And you are asking for $40,000,000 in this bill?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Where is No. 3 located?

Gen. DICKSON. We are asking for $45,000,000 for Nos. 3 and 4 in this bill.

Mr. BORLAND. Where are they ?

Col. JOYES. They are to be in Ohio.

Mr. BORLAND. One at Elizabethtown and one at Toledo.

Col. JOYES. Yes; because at both of these places we can get power.

Mr. BORLAND. What kind of power?

Col. JOYES. It will be steam electric power.

Mr. BORLAND. You got the first plant out of this $20,000,000 nitrate-supply appropriation contained in the national-defense act?

Col. JOYES. Yes, sir. We got $5,000,000 out of the so-called nitrate plants appropriation, under the national defense act, and we had to get a little more from the national security and defense fund.

Gen. DICKSON. We borrowed that, and we have an item in here to cover it.

Mr. BORLAND. Let us understand about that. How much did you get from the $20,000,000?

Col. JOYES. In the first place, I had $3,000,000 out of the national defense act; then I had $2,000,000 more, and then I asked for $3,500,000 more, because I had gotten to the point where I could make a real estimate, where I could take into consideration the market conditions, and that was given as a loan out of the national security and defense fund.

Mr. BORLAND. Making a total of how much out of that appropriation?

Col. JOYES. That is all.

Mr. BORLAND. A total of how much?

Col. JOYES. Making a total for the ammonia plant of $8,500,000.

Mr. BORLAND. You had that much out of the national defense appropriation?

Col. JOYES. No, sir.

Gen. DICKSON. He first got $3,000,000 and then $2,000,000 out of the $20,000,000 appropriated for the nitrate plants; he has gotten $5,000,000 out of that appropriation.

Mr. BORLAND. That is all?

Col. JOYES. That is all; yes.

Gen. DICKSON. We got a little for land, did we not?

Col. JOYES. No; that is all we had for that ammonia plant—No. 1 plant.

Mr. BORLAND. Where did you get the balance of the money?

Gen. DICKSON. We had $3,500,000 allotted out of the $100,000,000 appropriated as a national security and defense fund, and they told us we would have to provide for that and return it.

Mr. BORLAND. Does that complete your plant?

Col. JOYES. That completes the ammonia plant. Then, we asked for $3,000,000 for the oxidation plant and the manufacture of ammonium nitrates, to carry the product from ammonia to ammonium nitrate.

Mr. BORLAND. You use the ammonium nitrate direct in the explosives?

Col. JOYES. Yes, sir.

Gen. DICKSON. But he makes ammonia at that plant.

Mr. BORLAND. For what purpose is ammonia oxidized? Why do you have to have this second plant?

Col. JOYES. It is really a part of the same thing, but we have separated it and said that $8.500.000 was what was necessary to produce the ammonia plant. We did that because that was the General Chemical Co.'s process, and we are keeping our cost records distinct and separate from that, and that is for the purpose of trying it out. Then, we want $3,000,000 more to put in the necessary apparatus to change the ammonia into ammonium nitrate.

Mr. BORLAND. That is the product which you use in the explosives?

Col. JOYES. Yes, sir; the ammonium nitrate.

Mr. BORLAND. Now, you got $600,000 on July 30, 1917, out of this $20.000,000 national-defense fund for the building of a plant for the oxidation of ammonia into nitric acid.

Col. JOYES. Oxidation and concentration I think you will find that reads.

Mr. BORLAND. Possibly.

Col. JOYES. And we are building out of that our concentration. I asked that that be changed and that the $600,000 be allowed to cover simply the concentration feature. That concentration is to take the nitric acid after we have made it about 50 per cent strong and bring it up to a strength of 94 per cent. That is an experimental and investigative plant entirely. It will produce, when running, a respectable quantity of strong acid, but we are putting it up and going to operate it intermittently to find out just what it is worth. The purpose of that would be to see whether it would be worth while to build other plants of that type, to see if we can make any improvements in the art as it is now known and be able to take ammonia from by-product coke ovens, say, or anywhere else, and make that into strong nitric acid, which is required for the powder works, and do it at such a price that it would be attractive.

Mr. BORLAND. If I understand you correctly, the ammonium nitrate can be used in that form for the manufacture of high explosive shells.

Col. JOYES. It can be used in that form as a bursting charge.

Mr. BORLAND. But it is not available in that form for the ordinary smokeless powder, which is the big output.

Col. JOYES. No.

Mr. BORLAND. Then it will take another process to get it in such shape to be used in that way.

Col. JOYES. It would take another process, yes; but you would never do that.

Gen. DICKSON. At one stage in the process weak nitric acid is produced, and by this concentration process it is converted into strong nitric acid which can be immediately used to make powder. At another stage ammonia is obtained. Now, you can carry that one step further and get ammonium nitrate, which is used as the bursting charge in high explosive shells, and then you can take the ammonia and there is a process by which you can make nitric acid out of that.

Mr. BORLAND. Then the final product you want to make is the trong nitric acid?

Col. JOYES. Yes, sir.

Mr. BORLAND. What are your facilities for getting that?

Col. JOYES. We have no facilities for getting it at present, other han this very small experimental concentration plant. That would e run on a very small scale. We would concentrate about 24,000 ounds of nitric acid per day, and that would make, speaking oughly, 20,000 pounds of powder per day.

Mr. BORLAND. That would not amount to anything.

Col. JOYES. No; but I have been very seriously trying to find something that would lend hope that we could make some nitric acid for the powder plants, because of the fact that at the rate we are building, with no corresponding increase in the production of nitrate in Chile and with an increasing difficulty in transporting what we can get, something ought to be done, if we can possibly do it.

Mr. BORLAND. On what basis are you figuring on getting the nitrates for all of these powder plants?

Col. JOYES. At present?

Mr. BORLAND. I will not ask you that yet. Let us finish what we have here. You have four plants, then—plants 1, 2, 3, and 4; two of them at Sheffield, Ala., one at Elizabethtown, Ohio, and one at Toledo, Ohio.

Col. JOYES. Yes, sir.

Mr. BORLAND. Their final product is ammonium nitrate?

Col. JOYES. Yes, sir.

Mr. BORLAND. Which you can use in the high explosives?

Col. JOYES. Yes, sir.

Mr. BORLAND. You have only one plant under consideration for the making of strong nitric acid, and that is the experimental plant you have referred to?

Col. JOYES. Yes, sir.

Mr. BORLAND. How far have you gotten with that concentration plant?

Col. JOYES. The steel is going up, and some of the special acid proof masonry is done. The entire plant is all coming along well.

Mr. BORLAND. How much is your investment there?

Col. JOYES. It will be well within the $600,000; probably about $400,000, or perhaps less than that.

Mr. BORLAND. So you are doing it all out of this national defense money?

Col. JOYES. Yes, sir.

Mr. GOOD. I understood you to say you had received something like $3,500,000 out of the national security and defense fund?

Col. JOYES. The $20,000,000 appropriated in the national defense act for a nitrate supply is denominated on our books as "Nitrate plants." Out of that $20,000,000 we have had $5,000,000 for the ammonia plant and we have had $600,000 for this concentration plant. Now, the $3,500,000, which was given to help finish the nitrate-of-ammonia plant, was borrowed from another appropriation, the $100,000,000 appropriated for national security and defense.

Mr. GOOD. That is the President's fund?

Col. **Joyes.** Yes, sir.

Mr. **Good.** I understood the general to say that when you got that $3,500,000 it was understood it had to be paid back.

Col. **Joyes.** Yes, sir; so that he is asking you to appropriate it now.

Mr. **Good.** Where is there any authority for anyone to demand the repayment of that money?

Gen. **Dickson.** All I know about that is that when the War Department allotted this money to us they told us to submit an estimate for it to the Congress.

Mr. **Good.** Have you had any other funds out of this $100,000,0 which you have had to repay?

Gen. **Dickson.** Yes, sir. Just about a year ago the President allotted to the Ordnance Department $35,000,000, as I remember, and told the chief of ordnance to submit an estimate to the Congress; to tell Congress where it had been gotten, why it was gotten, and that it was to be repaid.

Mr. **Good.** I remember about that; and Congress gave you the money?

Gen. **Dickson.** Yes, sir.

Mr. **Good.** But have you received any moneys from that fu which you have repaid without having received express authority from Congress to do so?

Gen. **Dickson.** I do not know, sir. The only transactions whi have come to my notice was that one and this one.

Mr. **Borland.** You had $150,000 on March 12, 1918, for the purchase of additional land for ammonium-nitrate plant No. 2.

Col. **Joyes.** Yes, sir.

Mr. **Borland.** $250,000 on the same date for the purchase of land for a site for ammonium-nitrate plant No. 3.

Col. **Joyes.** Yes, sir.

Mr. **Borland.** So that makes $400,000 more out of this $20,000,0 national defense fund?

Gen. **Dickson.** Yes, sir; but you were asking a while ago for what we got for No. 1.

Col. **Joyes.** I was limiting my replies entirely to No. 1.

Mr. **Borland.** Does that cover all land you intend to purchase?

Col. **Joyes.** Yes, for the No. 2 plant; those allotments will amply cover land probably needed for the entire plant. The sum estimate for plants 3 and 4 may have to be somewhat increased, and I think it will, in view of the fact that we are buying the land in two different places instead of providing for one single plant.

Mr. **Borland.** What did you pay for the land for plant No. 4?

Col. **Joyes.** Plants 3 and 4 are sometimes spoken of as 3a and 3 and they are both half-sized plants. No land has been bought as yet for them.

Mr. **Borland.** They are to be at different places and the land must be bought separately for them?

Col. **Joyes.** Yes, sir. At the time we got this allotment of $250,0 set aside for plant No. 3 it was expected that the plant would all be put on one single piece of ground, and that it would be equivalent to plant No. 2, 110,000 tons of ammonium nitrate per annum.

Mr. **Borland.** But now you have split No. 3?

Col. **Joyes.** Yes, sir; the plan has been changed, so that we will make two plants of 55,000 tons capacity.

Mr. BORLAND. You have not bought any land as yet?

Col. JOYES. Not yet, sir.

Mr. BORLAND. But you have a quarter of a million dollars?

Col. JOYES. Yes, sir.

Mr. BORLAND. Is that sufficient to buy the land?

Col. JOYES. It will probably have to be increased somewhat out of funds that I think the Ordnance Department can find.

Mr. BORLAND. I see from the statement given me by the Secretary of War as to the expenditure of the $20,000,000 fund contained in the national defense act that the first allotment was $100,000 for use in the investigation as set forth in the national defense act. That is something, I suppose, that applies to the committee?

Col. JOYES. Yes, sir.

Mr. BORLAND. Ten thousand dollars for the expenditures by the interdepartmental board on the location of nitrate plants; $10,000 for investigation of nitrate deposits in Guatemala.

Col. JOYES. Yes, sir.

Mr. BORLAND. Did that produce any beneficial result?

Col. JOYES. No, sir; but something might come out of that in the future. The people who went down there found little pockets of nitrate, potassium nitrate I think it was, down there, but at any rate they found some small pockets which were fairly weak; but after they came back they were told that they had not gotten on to exactly the right ground and that there really were some places where there were larger deposits and of better quality. Something might possibly come from that, but I doubt it very much.

Mr. BORLAND. Then you got $3,000,000 for the construction of a synthetic ammonia plant. That is what you call plant No. 1?

Col. JOYES. Yes, sir.

Mr. BORLAND. Then you got $600,000 for use in the building of a plant for the oxidation of ammonia into nitric acid?

Col. JOYES. Yes, sir.

Mr. BORLAND. Then you got $200,000 for the industrial development of the Bucher or Cyanide process?

Col. JOYES. Yes, sir.

Mr. BORLAND. What has been done under that?

Col. JOYES. We have spent practically nothing under that except some money for a few incidental expenses. We have had a couple of men up at the plants to study their process and to see what there was in it. We have signed an agreement with the owner of the process in which we have practically accepted his tender of the right to use the process free of royalty for war purposes and with a certain specified royalty in case we use it to make fertilizers. But the process has considerable disadvantages as a process for manufacturing ammonia in its present development, and we have not considered that it has had a sufficient degree of development at this time to justify building that plant.

Mr. BORLAND. So you have not used that?

Col. JOYES. No, sir.

Mr. BORLAND. Then you got $100,000 for the active prosecution of investigation of processes for the industrial production of nitrate compound useful in the manufacture of explosives or fertilizers. What have you done with that?

Col. JOYES. That is being drawn on as needed for incidental expenses. We have built a laboratory and equipped it down on the site of plant 1, where we have some facilities for trying out the different processes. We have had a good deal of travel and some employment of special experts to investigate things for us, and that is about as far as we have gone in the expenditure of that money. Little allotments have been made here and there to universities who are trying out certain lines of investigation for us, and so on, allotments, say, of $1,000, or something like that.

Mr. BORLAND. On November 22, 1917, you got $200,000 for the purchase of a site for an ammonium nitrate factory. What is meant by that?

Col. JOYES. That is plant No. 2. That was the first allotment for the plant site at Muscle Shoals.

Mr. BORLAND. And the $150,000 was the additional cost of that plant?

Col. JOYES. Yes, sir.

Mr. BORLAND. Then you got $2,000,000 for the completion of the construction of the synthetic ammonia plant? That was in addition to the $3,000,000 which you had before, and you got $200,000, and $150,000, and $250,000 for the purchase of land for plants 2, 3, and 4?

Col. JOYES. Yes, sir.

Mr. BORLAND. On November 16, 1917, you got $500,000 for the acquisition of necessary lands, and for the beginning of construction of Lock and Dam No. 2, at Muscle Shoals.

Col. JOYES. That was given to the Engineer Corps, sir.

Mr. BORLAND. And not to you?

Col. JOYES. Not to us.

Mr. BORLAND. And on February 23, 1918, you got $12,880,000, which was the balance of this $20,000,000?

Col. JOYES. That was given to the Engineer Corps, also.

Mr. BORLAND. What can you tell the committee as to the bearing the completion of Lock and Dam No. 2 will have upon the operation of any of those nitrate plants? Will that lock and dam furnish you with the power necessary when completed?

Col. JOYES. When that dam is completed and ready to furnish water power there will be two results so far as we are concerned. In the first place, it is to be expected that water power can be furnished from that river system to the United States nitrate plant No. 2, right there at Muscle Shoals, more cheaply than that plant can make it from its steam power plant, and the plant will, therefore, take the power and thus reduce the cost of producing ammonium nitrate. Furthermore, the 60,000-kilowatt steam plant, say an 80,000-horsepower steam plant, which has now been built at plant No. 2, will become a standby or relay station for the water-power development and will enable that much more of the power from the river to be sold as continuous power.

Mr. BORLAND. Will the completion of Lock and Dam No. 2 produce power without any further development at Muscle Shoals?

Col. JOYES. It will produce a certain amount of power; yes, sir.

Mr. BORLAND. How much?

Col. JOYES. I am not qualified to speak of that, sir, because that in the hands of the engineers, and they know their projects. I do not know even, except by hearsay, what head it will have over the dam, but I have heard it said—and I think it may be safely said—that it will be something under 100,000 horsepower of strictly 100 per cent power. Of course, if certain industries could take it 10 hours a day or could, perhaps, get along for 11 months in the year, or something like that, they could take it in addition to the 100 per cent power.

Mr. BORLAND. The question is this: Are you familiar enough with the situation down there to know whether there will be an additional dam needed before Lock and Dam No. 2 can be used?

Col. JOYES. I understand that it is absolutely certain that Lock and Dam No. 2 can be used without any other dam at all. The other dams would simply be for the purpose of increasing the amount of power, and I think it is unquestioned that the amount of power that could then be sold, after the one dam was built, would probably be proportionately greater, so that the whole block of power could be sold at less money, and the fixed charges would be better taken care of by the larger output.

Mr. BORLAND. How much is the gross amount of power that could be used by the two United States Government plants that are there within reach?

Col. JOYES. Approximately 100,000 horsepower, sir.

Mr. BORLAND. These two plants will use 100,000 horsepower?

Col. JOYES. Approximately that; yes, sir.

Mr. BORLAND. The first plant was only to use five or six, was it not?

Col. JOYES. The first plant is almost negligible; the second plant uses from 70,000 to 75,000 kilowatts, nearly 100,000 horsepower in itself.

Mr. BORLAND. And that is steam power?

Col. JOYES. Well, not strictly, because in order to be sure of having power before we could count upon having the power plant completed at Muscle Shoals, or plant No. 2, we linked in with the Alabama Power Co., and while any power that we will buy from them will most probably be steam power we might, at certain times of the year, get some of their water power. We have tied into their system so that we always have their big reservoir of power as a reserve to guard against emergencies.

Mr. BYRNS. Your statement that less than 100,000 horsepower can be secured there is with reference to this one dam?

Col. JOYES. Strictly; yes, sir.

Mr. BYRNS. My question awhile ago was with reference to the amount of horsepower that could be acquired at Muscle Shoals by proper development, and as I understand it is many times that.

Col. JOYES. I dare say it is. I do not know about that. I have not studied the program of the engineers at all. Of course anything I say to you gentlemen about the power development on the Tennessee River is merely hearsay, because that is in the hands of the Engineer Corps and they are the only ones who are qualified to tell you anything about it.

Mr. BORLAND. You are asking in this bill, as I understand it, for $40,000,000 for the No. 2 plant?

Gen. DICKSON. We are asking for $40,000,000 for the Sheffield Plant No. 2, which is the cyanamid process, and $45,000,000 for what are known as plants 3 and 4, the same process.

Mr. BORLAND. I thought I understood you to say that you were asking for an appropriation for the construction of an arc plant?

Col. JOYES. That goes into United States nitrate plant No. 1; sir. That was a request for an appropriation of $5,000,000, made upon my recommendation, for the purpose of putting in small units to try them out and ascertain whether we can find any hope in the arc process.

Mr. BORLAND. Where do you expect to get the $5,000,000?

Gen. DICKSON. We are asking you, gentlemen, for it.

Mr. BORLAND. That would be experimental, then?

Col. JOYES. That would be experimental; experimental in this sense, to determine whether we can make it produce at a cost that compares well with the other processes. There is no question whatever about its producing; it is not experimental in that sense at all.

Gen. DICKSON. And also to learn how to operate the process so that if an emergency arises we can put up a number of these plants wherever there is power available.

Mr. BORLAND. What has been done in following out the recommendations of the nitrate supply committee about securing nitrates from by-products of coke ovens?

Col. JOYES. There has been a considerable amount of that work done. The division I have charge of has tried to give its moral encouragement to the by-product coke-oven people wherever it came in contact with them, and we have recommended several projects for direct financial aid to the people who have had that directly in charge, and they can speak of what they have done better than I can.

Col. SPRUANCE. Mr. Chairman, the stimulation of by-product coke-oven construction in this country has been with a view to producing toluol and ammonia; the latter supplying nitrogen in the form NH_3. The ammonia is converted into ammonium sulphate or ammonium nitrate. There has been quite an increase in by-product coke-oven installations due to the abnormal conditions. This reached the point where the private corporations did not feel they could go much further without Government aid. Recently, in an effort to develop both toluol and ammonia (the shortage of toluol being very serious), negotiations were undertaken by the Ordnance Department that will result in the installation of about 1,500 additional by-product coke ovens, which will produce the two things that are most needed for the explosives program, namely, ammonia and toluol, and also conserve coal and increase the supply of coke.

Mr. BORLAND. And do you not also recover a by-product that is used in the dyestuffs and print-ink business?

Col. SPRUANCE. Yes, sir; almost everything in the dye industry comes from by-product coke ovens, coal-tar products.

Mr. BORLAND. Is it a fact that that process is self-supporting in time of peace as well as in time of war?

Col. SPRUANCE. Yes, sir.

Mr. BORLAND. In other words, it differs from the arc process and these other processes of procuring nitrogen in large quantities for explosives in the fact that you can support it in time of peace on a large enough scale to be immediately available in time of war?

Col. SPRUANCE. If you do not build too many of them.

Mr. BORLAND. Of course. If you have a large market for your dyestuffs and printing inks you would not be apt to overbuild your market.

Col. SPRUANCE. Of course, the output of by-products is very important, but the main products are coke and gas.

Mr. BORLAND. You say negotiations are in process; how do you assist in it?

Gen. DICKSON. In this way: There have been a number of beehive coke ovens which have been converted into by-product coke ovens by the owners. In one or two cases large companies are making the conversions at their own expense, provided the Ordnance Department will agree to take the toluol and other products that we require, like ammonia, for two years. Then, there are a number of beehive coke-oven owners who simply have not the capital to make the change but are willing to do so, and in those cases we have to advance the money on the basis of getting it back eventually, or part of it back.

Mr. BORLAND. How much do you advance in those cases?

Gen. DICKSON. I do not know the details of that. Col. McRoberts is making all those contracts. He has Col. Watson handling that exclusively, practically.

Mr. BORLAND. Out of what funds do you advance that money?

Gen. DICKSON. We are asking you for $40,000,000 to construct by-product coke ovens.

Mr. BORLAND. You are asking for that in this bill?

Gen. DICKSON. Yes, sir; in the supplemental estimates that you are now considering.

Mr. BORLAND. What result do you expect to get with that $40,000.000 in the way of a supply of nitrates?

Gen. DICKSON. You mean the total output?

Mr. BORLAND. Yes. How much nitrate do you expect to get?

Col. SPRUANCE. It is primarily not for nitrate but for toluol.

Mr. BORLAND. But you will get nitric acid eventually?

Col. SPRUANCE. No, sir; I do not think any of it will ever be converted into nitric acid.

Mr. BORLAND. Then, this is an expenditure for toluol?

Col. SPRUANCE. Yes, sir; of course, you get large quantities of ammonia, but the primary object is to get toluol.

Gen. DICKSON. For making T. N. T. (trinitrotoluol).

Col. SPRUANCE. We will get 4,000,000 gallons of toluol per annum from these 1,500 by-product coke ovens. That is the estimate.

Mr. BORLAND. Do you get any nitric acid which is used in the manufacture of the ordinary smokeless powder?

Col. JOYES. No, sir; but we will get ammonia, which you could make into nitric acid if you wished.

Mr. BORLAND. But do you make nitric acid?

Gen. DICKSON. We will probably make it into ammonium nitrate.

Mr. BORLAND. And that is used for high explosives?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. We have not yet got down to the program for securing nitrates for the enormous supply of smokeless powder.

Col. SPRUANCE. But do you realize, Mr. Chairman, the proportion of high explosives to the smokeless powder required?

Mr. BORLAND. Yes; I try to realize it. I do not know whether I fully realize it or not.

Col. SPRUANCE. It is about as large as the smokeless-powder program. Do you realize that?

Mr. BORLAND. No; I did not grasp that it was as big as the smokeless-powder requirements, but I have not yet discovered that we have got any independent supply of nitric acid for smokeless powder.

Col. JOYES. We have not, sir.

Gen. DICKSON. That is exactly where the shoe is pinching, and that is why we want this money to experiment and develop this arc process, in case we can not get nitrate from Chile.

Mr. BORLAND. Then why are we spending $13,000,000 on developing water power when we have not got what we went after, to wit, a nitrate supply?

Col. JOYES. You mean the spending of money on the water-power development at Muscle Shoals?

Mr. BORLAND. Yes. We can expend money for water power on the Mississippi, or at the Roosevelt Dam, or any place else on earth, and the primary purpose of that fund was to secure a supply of nitrate.

Gen. DICKSON. Mr. Chairman, that is hardly a matter, I think, any of us could really give you a correct answer about. We are proceeding along the lines that that board has told us to follow.

Mr. BORLAND. They expressly stated there was absolutely no use of spending a dollar of that money on the development of water power.

Col. JOYES. May I say a word there, sir? I know from analyzing these reports of the several persons and of the committees, and also from reading official correspondence and from conversations with those people, that they recommended that no portion of that $20,000,000 be spent at that time for the development of water power, because at that time they could not see that there was a sufficient prospect of a water power so developed being used primarily for the primary purpose of the act, the production of nitrate. They were quite clear on that. Several of them who were most opposed to a recommendation to spend any of that money for a water-power development have told me specifically and flatly that they were cordially in favor of development of water powers, but they did not wish to recommend it out of that specific appropriation, because it would not, in their opinion, tend directly to the purpose of the act.

Mr. BORLAND. I gathered that from their report.

Mr. GOOD. What has plant No. 1 cost up to date?

Col. JOYES. It is not quite completed yet, sir.

Mr. GOOD. What will it cost when completed?

Col. JOYES. Speaking of it as an entire plant, the project now going on comprises an ammonia plant, which we figure at $8.500.000; also a plant to carry that ammonia to ammonium nitrate, which we estimate at $3.000.000. I think we will save something on that, but I am not sure. Then I have an item of $982.000, which I am asking for more or less incidental purposes connected with the entire establishment, the excess amount of land purchased, a certain share of the improvement of roads, railroads, fencing, and a number of incidental things like that; some of the living quarters for the forces that will work on experimental work, the experimental laboratory, and various odds and ends like that which are not strictly chargeable to the ammonium nitrate proper, making a grand total of $12,482,000. We also have estimates here for certain additions, experimental processes, which we would like to get on that reservation, because there we think we could have our same forces of technical men study the different processes in close proximity, one with another, and thereby give a better opinion as to the value of one in comparison with the other. The total of the estimates under this head for completion of the plant started and for experimental projects is $15,982,000.

Mr. GOOD. Does that take into consideration anything for developing power at Muscle Shoals?

Col. JOYES. Absolutely nothing.

Mr. GOOD. Plant No. 2 you are estimating will cost $40,000,000?

Col. JOYES. Yes, sir.

Mr. GOOD. And the other plant $45,000,000?

Col. JOYES. The other two half plants.

Mr. GOOD. And you are asking for $5,000,000 more for this experimental work on the arc process?

Col. JOYES. That would be in connection with and in addition to the plant No. 1 item which I have just given. Included in the $15,982,000 I have recited to you, we would like to spend about $1,000,000 for an ammonia plant to work by a new process, the sodium cyanide. Not the Bucher process mentioned in the committee report, but a new one which has come to light and which seems to be in a better state of commercial development than that, and amply warranting a considerable sized plant to try it out.

Mr. GOOD. Then I gather from your figures that with what you have already received and what you are asking for now, you contemplate a total expenditure up to June 30, 1919, of about $110,000,000 for the production of nitrate?

Col. JOYES. Yes; about $110,000,000, I should say.

Mr. BORLAND. And that is for nitrate for high explosives?

Mr. GOOD. Yes; except the $5,000,000 which they would use for experimental work.

Mr. BORLAND. Colonel, I want to get clear in my own mind, if I can, this question about the possibilities of nitrate from by-product coke ovens. This report, under the heading, "By-product ammonia," says:

> The nitrogen stored up through the medium of plant life of past ages as a constituent of bituminous coal is in part recovered as ammonia when bituminous coal is converted in by-product ovens into coke. This source of ammonia is to-day the chief source of combined nitrogen in all countries, including Germany. Ammonia produced by the destructive distillation of coal when pure is the same as any other ammonia and can be readily oxidized to nitric acid.

Does that mean they produce in that way the nitric acid for the ordinary manufacture of powder as well as high explosives?

Col. JOYES. It does not mean, sir, that in this country they are doing it.

The CHAIRMAN. I know they are not doing it in this country, but it says:

> This source of ammonia is to-day the chief source of combined nitrogen in all countries, including Germany.

The question is, Does that mean the whole supply of nitrate for smokeless powder as well as for high explosives?

Col. JOYES. Just how they are using their by-product ammonia in Germany, I do not know. I do not know that anybody in this country does know, although they may. But we do know that Germany in 1917, according to our best information, got out of their by-product coke ovens the equivalent of about 140,000 tons of nitrogen. How they used that, we do not know, but we presume, and I think it is reasonable to presume, that that was mainly made into ammonium nitrate. You understand that ammonium nitrate is a combination of ammonia (a nitrogenous product) used as the base, and of nitric acid (also a nitrogenous product) for the acid to nitrify it.

Mr. BORLAND. And that is available in that condition for the manufacture of high explosives?

Col. JOYES. Yes, sir.

Mr. BORLAND. But it is not available in that condition for the manufacture of the ordinary smokeless powder?

Col. JOYES. Ammonium nitrate is not, but the ammonia, as it comes from the coke oven, is. Perhaps that had best be cleared up a little bit. The ammonia you get from the by-product coke oven is not pure ammonia. It is recovered out of the process generally in one of two ways, either it is combined with sulphuric acid, making sulphate of ammonia, or it is absorbed in water, making aqua ammonia. Now, if you were going to make nitric acid out of that you would avoid the sulphate of ammonia process because it introduces some difficulties. The sulphur makes some trouble, and also the cost of the useless sulphuric acid is an extra expense. You would use the aqua ammonia if you could get it.

Mr. BORLAND. I could not go, with any familiarity, into the processes of it, but the question I asked was that if Germany and all other European countries, accordiing to that report, are dependent upon the by-product of coke ovens for their whole supply of nitrate, that would include the nitrate they used for the smokeless powder as well as the nitrate they used for the high explosives.

Col. JOYES. But they are not dependent upon that, sir.

Mr. BORLAND. And our experiments so far have only brought us a limited supply for the high explosives and no supply at all for the smokeless powder factories?

Col. JOYES. That is quite right, sir; but it would not be correct to say that since the European war commenced Germany has been dependent upon by-product coke ovens.

Mr. BORLAND. It would not be correct to say so?

Col. JOYES. Not at all, sir, as these figures will show you. In 1917, for example, Germany got from the by-product ovens something like 140,000 tons of nitrogen; from the cyanamid process about 80,000 tons of nitrogen, and from the Haber process about 100,000 tons of nitrogen, making a total of 320,000 tons. You will see that she got less than half from the by-product coke ovens, and from recent information I have she has probably increased that about one-third.

Mr. GOOD. From what sources?

Col. JOYES. Largely from the Haber and cyanamid processes, I should say, although that is just a probability, because we do not know. France has about 200,000 tons per annum of nitrogen made by these artificial fixation methods.

THURSDAY, MAY 23, 1918.

NITRATE PLANTS.

[See pp. 241, 277.]

Mr. BORLAND. Last night we were going into the subject of the nitrate supply from by-product coke ovens.

Gen. DICKSON. Col. Spruance can answer questions in that regard. You asked how much money had actually been disbursed to date on the Charleston and Nashville powder plants. I am prepared to report on that. The actual sum disbursed to date on the Charleston plant is $7,127,070.52, and on the Nashville plant $20,069,597.57. I was informed that the disbursing officers have a large number of bills for materials which the inspectors are inspecting and which the disbursing officers are auditing, in addition to the amounts actually disbursed.

Mr. BORLAND. Colonel, I want to get into the record a portion of Dr. Parsons's report in regard to by-product ammonia:

> The recovery and utilization of ammonia in by-product coal has been recognized by economists for decades to be one of the most important developments for conserving the wealth of the Nation. In Germany two-fifths of the coal used is carbonized in by-product coke ovens, and all of the coke produced is produced in plants fitted for the recovery of by-products, including ammonia. In this country less than one-tenth of the bituminous coal burned is coked in by-product ovens.
>
> Of the coke produced in America, over one-half is still produced in beehive ovens in which the gas, ammonia, and all other by-products are ruthlessly destroyed. There has been, nevertheless, a rapid increase in the installation and operation of by-product ovens and an increase in ammonia production that would not have been thought possible two years ago. By the end of the present year we will be producing at least 115,000 tons of ammonia per annum—an equivalent of 450,000 tons of ammonia sulphate. Six thousand tons of this ammonia in time of peace, or 55,000 tons in time of war, would meet the Nation's requirements of nitric acid for military purposes, as estimated by the War Department. The growth of our ammonia production from by-product coke has been extremely rapid and is still on the increase. More than $50,000,000 worth of by-product coke ovens have been contracted for within the past 12 or 13 months and are now completed or in process of erection. The installation of the by-product coke process means a larger supply not only of ammonia but also of benzol-toluol, phenol, naphthalene, and other products absolutely essential for munition purposes and required in time of peace for our present and future dye-stuffs industry. Benzol-toluol and phenol are only secondary in importance to an ample supply of nitric acid for war purposes. The use of the by-product coke process also means the production of large quantities of gas for power purposes. Indeed, if the destructive distillation of coal is conducted in special producer-gas ovens, the output of ammonia can be increased five to six fold, and power comparable with cheap hydroelectric power can be obtained at the same time. This method is now utilized in Germany on an immense scale for producing cheap power and increased ammonia output.

I want to ask you, first, about Dr. Parsons's figures, that by the end of the present year they had in sight 115,000 tons of ammonia; that the peace requirements of this country are about 6,000 tons, and the war requirements about 55,000 tons. What do you say about those figures? Do they measure up with your estimates?

Col. SPRUANCE. I should imagine that they were very proper estimates at that time. They were made in 1916 or the spring or winter of 1917 when the expected quantity of explosives and powder to be made from nitrates in the United States (for the requirements of the United States troops and such requirements as it might be desirable to manufacture in this country for the allies) was far less than it is now. I should say that in the present conception it varies from 4 to 10 times that quantity. In other words, the estimated war-time requirements for nitrogen, which is really the basis of all the explosives, as given by Dr. Parsons, would not begin to meet the present requirements.

Mr. BORLAND. What percentage would it be of the present requirements, according to the program?

Col. SPRUANCE. I should imagine that the total United States and allied requirements for production of powder and explosives in this country may reach a quantity corresponding to or the equivalent of six to ten times Dr. Parsons's figure of 180,000 tons of nitric acid.

Mr. BORLAND. So his statement is not more than from 10 to 16 per cent of what you are figuring on now?

Col. SPRUANCE. That is right; I should imagine that is about it. It is pretty hard to give an offhand answer to a question like that.

Mr. BORLAND. What has been the rate of progress in producing ammonia and these other products from by-product coke ovens? Has it gotten along as fast as his statement indicates?

Col. SPRUANCE. I have no statistical or other data showing the number of by-product coke ovens that were installed in the year 1917, but, as stated in the hearing yesterday, there are 1,500 additional by-product coke ovens that are being negotiated for along exactly the lines laid down and recommended by Dr. Parsons. The condition in 1917 as regards the development of by-product coke ovens was largely one of activity on the part of the private manufacturers. The Government's price of $1.50 for toluol was very attractive to them. Wherever a company could dispose of its coke and could see an outlet for its by-products, such as benzol, toluol, ammonia, etc., they put in the installations themselves. They reached the point, then, where, without additional assurance from the Government, in the form of orders which would take care of the output to a reasonable degree for a considerable period, they could not see their way clear, of their own volition, to increase the capacity. Then the Ordnance Department and the War Industries Board (who have appreciated this situation and desired a logical development along those lines) assisted them, as Gen. Dickson testified yesterday, in this further development.

Dr. Parsons's report refers to nitric acid as his basis for powder and explosives Government requirements. When Dr. Parsons wrote this report the present use of nitrate of ammonia for shell-bursting charges had not been developed, and it is easier and more economical to convert by-product ammonia into nitrate of ammonia than into nitric acid. The English Government developed the use of nitrate of ammonia as a bursting-charge explosive. Every pound of nitrate of ammonia is directly usable in the explosive program, and every pound produced synthetically will release the equivalent of one and one-quarter pounds, approximately, of nitrate of soda for use in the manufacture of strong nitric acid for other explosives and smokeless powder. With the development of the by-product ammonia for the explosive program it was found to be desirable, subsequent to Dr.

Parsons's report, to convert this ammonia into ammonium nitrate, used directly as an explosive, instead of into nitric acid, which would be a more uneconomical and difficult process.

Mr. BORLAND. Then that goes to show that the process which Dr. Parsons is discussing here is really a little better than he describes—a little more practical and available than he describes it?

Col. SPRUANCE. Applying the development of by-product coke ovens to meet the demands of the smokeless-powder program in a different way; yes. There is no question about Dr. Parsons's view that there is a possible logical development along this line, through the stimulation of the installation of by-product coke ovens, where they do not exist, and the substitution of such ovens for beehive coke ovens, from which they make no recovery of the by-products.

Mr. BORLAND. The stimulation of the installation of by-product coke ovens will have the effect of not only producing this ammonium nitrate, which can be used directly in the high explosives, but it will have the effect of stimulating the production of toluol and a great many of these other things that are listed. In addition to that it will have the effect of producing a certain amount of gas which will be available for fuel purposes.

Col. SPRUANCE. Yes, sir.

Mr. BORLAND. In view of those facts, are you able to enlighten the committee as to why this nitrate supply fund was not used more extensively and more promptly in the development of by-product coke ovens rather than in building a water power or something else? Why did we not pursue Dr. Parsons's program?

Gen. DICKSON. So far as the Ordnance Department knows it was considered advisable to develop about enough water power to take care of nitrate plants No. 1 and 2. The Ordnance Department commenced, about the middle of January, a vigorous campaign to secure the conversion of beehive coke ovens into by-product coke ovens.

Mr. BORLAND. The middle of January when?

Gen. DICKSON. 1918.

Mr. BORLAND. You have had this report since January, 1917?

Gen. DICKSON. It was about January, 1918, that the Ordnance Department obtained the schedule showing when troops would be called into the service in 1919, and about that time it was informed that the troops would be sent abroad more rapidly than the previous program had called for. These two pieces of information enabled the department to determine the requirements of powder and explosives, which requirements were so much larger than the previous requirements, based on the previous troop schedules, that prompt action was inaugurated to secure the additional fundamental materials required in the production of powder and explosives.

Mr. BORLAND. We understand all of that, General, and understand, furthermore—and I think you will coincide in it—that no available water power can be had at Muscle Shoals inside of three years from the time the development began, and at the end of that three years what you get is power, if you get anything, and then you have to apply that power to some factory or process in order to make it available for the production of nitrate. All you would have would be the power. Now, in view of that fact, and in view of the hurry to get the troops ready and the imminent necessity of increasing the supplies of explosives and powder, and in view of the fact that private manufacturers were willing to rapidly convert their coke ovens for the purpose of taking advantage of the high price of toluol and other by-products that could be obtained, why was not the nitrate fund immediately used to the full extent from that purpose? It was available for that purpose, and there is considerable doubt, legal and otherwise, as to whether it was available for the mere construction of power.

Gen. DICKSON. I am unable to answer that question.

Mr. BORLAND. Who decided that?

Gen. DICKSON. That was decided in the War Department, sir.

Mr. BORLAND. But by whom? We want to see if we can find out where the question was decided.

Gen. DICKSON. I do not know whether it was decided by the Chief of Staff or by the Secretary of War, but it was decided, I am sure, by one of those two.

Mr. BORLAND. You did not decide it?

Gen. DICKSON. No, sir.

Mr. BORLAND. Were you called upon for any recommendation on the subject?

Gen. DICKSON. None that came to my personal attention. It is possible that it might have come to the Chief of Ordnance and gone to Col. Joyes.

Mr. BORLAND. Will you see whether there exists in your department any recommendation on that subject, the date of it and character of it?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. General, the new estimates have just come in, transmitted to the committee by the Secretary of the Treasury. I have not had time to examine them with any care, but it seems that in the form in which they are transmitted the estimates under the Army appropriation bill and under this bill are together.

Gen. DICKSON. Yes, sir; I noticed that they were all combined. That was the way they left the department. Ordinarily, as I understand it, they are separated by the Secretary of the Treasury and put in form for the various committees of the Congress.

Mr. BORLAND. We had previously examined under A. of F. B into the item of $1,063,000,000, which is the first estimate coming within the jurisdiction of this committee. Under A. of F. C the amount estimated for by the Secretary of the Treasury is $2,701,394.437. Does that correspond with your estimate?

Gen. DICKSON. Yes, sir; that is the one we are explaining now.

Mr. BORLAND. That is a supplemental estimate, supplemental to the $25,500,000 estimate?

Gen. DICKSON. Yes, sir; that is the amount which we deducted yesterday, if you will remember, in the explanation.

Mr. BORLAND. For this additional powder plant you are asking only $15,000,000.

Gen. DICKSON. No; I have another item that goes with that of $30,000,000. A careful investigation of all existing powder-making facilities disclosed that certain increases in output could be made by some of the plants, and they were authorized, except in the case of an increase at the Carneys Point plant of the Du Pont company.

which that company thought could be increased by 200,000 pounds per day. The company soon realized that it had to use some of this land for additional air-drying facilities, which it is providing at its own cost, and also for increasing its solvent recovery equipment, which it is providing at its own cost, which increases made it impracticable to increase that plant by anywhere near the amount originally thought, namely, 200,000 pounds per day. At that time it was considered advisable to put a unit of 100,000 pounds per day capacity on land already purchased for the United States nitrate plant No. 1, so that the acid made in that nitrate plant could be used directly in the production of the powder without transportation. When it was found that the increase could not be made at Carneys Point it was manifestly advisable, because of the economy, to consolidate those increases and establish a single plant of about 300,000 pounds per day, for the reason that it is exceedingly difficult to get the required personnel to operate powder plants. Therefore it is now the present plan, if this additional producing capacity is to be provided, to put up a single plant, and there is not enough ground at Sheffield, near United States nitrate plant No. 1, for a plant of this capacity.

Mr. BORLAND. So you combine these two items of $15,000,000 and $30,000,000, giving you an estimate of $45,000,000, out of which, if necessary, you expect to create a third powder plant for the production of smokeless powder, similar to the Nashville plant and the Charleston plant?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Nothing has been done, however, along that line?

Gen. DICKSON. No, sir; other than to survey the field and select the site.

Mr. BORLAND. And it is still a matter of some doubt as to whether you will actually need it?

Gen. DICKSON. It is dependent upon Gen. Pershing making a change in the number of rounds which he has asked for per day for the large-calibered guns.

Mr. BORLAND. Now what other plant did you describe to me?

Gen. DICKSON. Continuing on that supplemental estimate, the next item is for No. 2 nitrate plant, estimated at $40,000,000.

Mr. BORLAND. No. 1 having been built out of the nitrate supply money and the President's fund?

PICRIC ACID PLANT.

Gen. DICKSON. Yes, sir. The next item is a new picric acid plant having a total capacity of 175,000,000 pounds per year, $30,000,000.

Mr. BORLAND. Has that been located?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Where?

Gen. DICKSON. That will be put in three parts, one at Brunswick, Ga., and for the other two Little Rock, Ark., and another point are under consideration.

Mr. BORLAND. This picric acid is used by the French for their high explosives?

Gen. DICKSON. Yes, sir; and we are erecting this plant to supply France and Italy.

Mr. BORLAND. Do you expect to aumortize the cost by your sales to France and Italy?

Gen. DICKSON. I have no knowledge of the financial arrangements which have been made.

Mr. BORLAND. General, in reference to the picric acid plant, I believe you have stated that this picric acid is not used in our process of manufacture, but is used by the French?

Gen. DICKSON. We use only a small amount, but France and Italy require very large quantities. They presented their needs to the War Department, and as a result we were instructed to supply them. France wants 120,000,000 pounds per year and Italy 36,000,000 pounds per year, in addition to what they are now getting in this country. The total requirements of picric acid for 1918 to be produced in this country for use by the allies is 184,000,000 pounds, and for 1919, 262,000,000 pounds. We were directed to provide additional facilities in this country for furnishing France and Italy 156,000,000 pounds per year, and we only added 19,000,000 extra to that, because you have got to have a little leeway, and we made the plants of a total capacity of 175,000,000 pounds per year.

Mr. BORLAND. You have divided this picric acid plant into three units. What factors determined your location of those plants?

Gen. DICKSON. We divided them into three plants in order to get competition and also to take advantage of companies now in existence that are producing picric acid, to use their engineers and organized force.

Mr. BORLAND. Is there such a company at Brunswick, Ga.?

Gen. DICKSON. I do not think that company has a plant there, but it is going to put one up there.

Mr. BORLAND. What company?

Gen. DICKSON. The Butterworth-Judson Corporation.

Mr. BORLAND. What peculiar facilities has Brunswick, Ga.?

Col. SPRUANCE. As to the question of the location of these plants, one of the most important things with reference to picric acid is the disposal of the waste water and the type of labor. Negro labor is probably the best you can get for it. They are not turned yellow, as the white man is, by working in picric acid; and then the fact that the expansion in the Atlantic States, where most of the plants are located now, has been so great that the labor situation has called for the installation of every plant possible at some other location, where both the housing facilities and the available labor are not now worked or taxed to the limit. It is largely a question of policy from the standpoint of location. As to the operations that exist now at any one of the three proposed sites, there are at present no operations of this character, i. e., the manufacture of picric acid, but the three companies that will work in this way for the Government comprise men experienced in the manufacture of picric acid, and thus the Government will secure the competitive feature that Gen. Dickson mentioned.

Mr. BORLAND. There are no such plants at Little Rock, Ark.?

Col. SPRUANCE. No; but at Little Rock they found quite a large labor market, which was utilizable, and in addition to that very considerable housing facilities which could be used, whereas in many other districts, congested as they are now in the Atlantic States, the conditions are such that the facilities are already overtaxed, and delivery of some of the raw materials required for picric acid involve a shorter haul in the case of these locations than some other localities.

Mr. BORLAND. It would all be hauled to the seaboard?

Col. SPRUANCE. The finished product, yes; but I meant the raw material.

Mr. BORLAND. What is the raw material?

Col. SPRUANCE. Sulphur, benzol, and nitrate of soda; the nitrate of soda either at a gulf port or an Atlantic port. They are the principal ingredients.

Mr. BORLAND. None of them are found at those locations?

Col. SPRUANCE. Not exactly, sir, but most of the sulphur being used to-day in the manufacture of explosives comes from Louisiana, and there is also a Texas development.

Mr. BORLAND. And Wyoming?

Col. SPRUANCE. Not very much there, sir, and nothing like the Louisiana deposits.

Mr. BORLAND. Is it intended that these plants shall be of any value after they have finished furnishing the picric acid requirements of France and Italy? Will they be of any permanent value to the Ordnance Department?

Col. SPRUANCE. I can not answer that, but probably not, sir. So far as the acid producing or manufacturing equipment is concerned it may be said that the acid-producing capacity in the United States that will be available after the war will probably be far in excess of the maximum peace-time requirements.

BAG-LOADING PLANTS FOR SMOKELESS POWDER.

Gen. DICKSON. The next item is three bag-loading plants; that is, plants for taking smokeless powder and putting it into bags as finished powder charges. The amount is $10,000,000.

Mr. BORLAND. I forgot to ask you whether you had started in on this picric acid plant?

Gen. DICKSON. One is to be at Brunswick, Ga.

Col. SPRUANCE. Two contracts have been signed. One site has been definitely settled on and construction is being started, while the others are in process of negotiation.

Mr. BORLAND. How much have you expended at Brunswick?

Col. SPRUANCE. Practically nothing.

Gen. DICKSON. I think we have made no payments on them.

Mr. BORLAND. Where are the bag-loading plants to be located?

Gen. DICKSON. There are three bag-loading plants. One is to be located at Tulleytown, Pa., one at Woodbury, N. J., and one near Richmond, Va.

Mr. BORLAND. They are for the purpose of loading powder into bags for large charges.

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Why is not that done in conjunction with the manufacture of the powder?

Col. SPRUANCE. That operation has never been conducted at a smokeless powder manufacturing plant, generally for the reason that it will involve not only the handling but the storage of very large quantities of smokeless powder which, in the event of an accident might involve the loss of the smokeless powder producing equipment which would not only be very difficult to replace, but which would involve a very large loss, which would not be involved if that operation were carried on at an entirely different location.

Mr. Borland. The powder has to be shipped to these points?

Col. Spruance. Yes, sir.

Mr. Borland. And there loaded into bags?

Gen. Dickson. The powder is brought from the powder plants to these bag-loading plants, not only the smokeless powder, but we also have to bring the black powder used for igniting the smokeless powder. Then the raw silk bags are made and igniters are sewed into pieces of the silk; then the bag is sewed up with one end open; the smokeless powder is then put into the bag and that is sewed up.

Mr. Borland. How is the powder transported from the powder works to these factories—in what sort of containers?

Gen. Dickson. In wooden boxes with zinc linings, hermetically sealed, and then they are returned to the powder factories for reuse.

Mr. Borland. How many employees will these factories have?

Col. Spruance. My recollection is that there are 4,000 per plant, but I can not be sure about that.

Gen. Dickson. The capacity of each plant is 20,000 charges per day.

Mr. Borland. Have you a statement showing how many employees there will be?

Gen. Dickson. No, sir; I have not.

Mr. Borland. Where did you say the other two plants were to be located, outside of Richmond?

Gen. Dickson. Tullytown, Pa., and Woodbury, N. J., not very far from Camden.

Mr. Borland. Where is Tullytown, Pa.?

Col. Spruance. On the Delaware above Philadelphia, and near Bristol.

Mr. Borland. Have those plants been finished?

Gen. Dickson. They are reaching completion.

Mr. Borland. All three of them?

Gen. Dickson. Yes, sir; they are well under way.

Mr. Borland. Do you understand that they now have a restricted district north of the Potomac and east of the Alleghenies in which no more plants are to be located?

Gen. Dickson. Yes, sir; we know that.

Mr. Borland. This decision was made before that?

Gen. Dickson. Yes, sir.

Mr. Borland. And they are reaching completion?

Gen. Dickson. Yes, sir. Some powder from Charleston, W. Va., can go to Richmond, be put into bags and go right on to Norfolk. Other powder, some from Charleston, some from Nashville, and some from Carney's Point, can go to these other places and then go on to the New York port of embarkation.

Mr. Borland. If the only reason why these plants are not put at the powder plants themselves is that premature explosions in these loading plants might endanger the powder works, why were they not put within trucking distance from the powder plants, where the powder plants would be safe from premature explosions but close enough to be practically operated together?

Gen. DICKSON. That could have been done, but at Charleston the added labor necessary would have been a serious matter. We probably could have gotten enough additional labor in the neighborhood of Nashville, although I do not know that is certain, but I am sure we could not have gotten it at Charleston without putting up houses.

GAS GENERATING AND GAS SHELL-FILLING PLANT.

Mr. BORLAND. What is the next item?

Gen. DICKSON. The next item is a gas generating and gas shell-filling plant at the Edgewood Arsenal, $30,000,000. That plant is composed of four units and we are asking for three of the units in this bill, one unit having been previously appropriated for. At that time it was thought it would be put up in France, but now we are using that money to put it up here, so that there are now three units for putting gas into shells which must be provided for. Then there is a plant for generating chlorine. That plant is to have a capacity of 100 tons per day. Then there is one plant for generating S-1 gas and another one for generating L-4 gas.

Mr. BORLAND. They are all located at Edgewood?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. And are all embraced in this expenditure?

Gen. DICKSON. Yes, sir; including a power house and a hospital. These plants must be operated by officers and enlisted men, and, therefore, some temporary quarters and temporary barracks for housing the personnel are included.

Mr. BORLAND. This construction is to be on the grounds of the Aberdeen proving ground?

Gen. DICKSON. Yes, sir; it is a part of the Aberdeen proving ground.

PLANTS FOR FILLING PROJECTILES WITH HIGH EXPLOSIVES.

Mr. BORLAND. What is your next item?

Gen. DICKSON. Two plants for filling projectiles with high explosives, $12,500,000.

Mr. BORLAND. Where are they located?

Gen. DICKSON. One is located at Mays Landing, N. J., and the other at South Amboy, N. J.

Mr. BORLAND. How far have they progressed?

Gen. DICKSON. They are nearing completion.

Mr. BORLAND. Are you keeping within your estimates?

Gen. DICKSON. We expect to do so; yes, sir. One of those plants has a daily capacity of 25,000 75-millimeter shell, 12,000 155-millimeter shell, and 4,000 8-inch or larger caliber shell. The other plant has the same capacity.

Mr. BORLAND. Where do you get your shells for loading? Are they made under contract?

Gen. DICKSON. Yes, sir. We ship to those places the machined shell and booster casings. In the case of the 75-millimeter shell we also send cartridge cases and some black powder to be used as igniters of the smokeless powder, so that they can load a complete cartridge.

Mr. BORLAND. Do you have contracts with shell manufacturers by which they deliver to you a completely loaded shell?

Gen. DICKSON. Not as a rule.

Col. SHINKLE. We have some plants. The situation as to that was that at the outbreak of the war we placed all the contracts that could be placed in that manner, but the industry developed in this country as a result of the European war had mostly been the manufacturing of components and not of completed rounds. There were comparatively few companies that could manufacture and deliver complete rounds of ammunition. Those facilities have been utilized, but a great part of the production is now obtained by the manufacture of components by those factories suited to make those components, and they must then be brought together and assembled into complete rounds of ammunition.

Mr. BORLAND. How far are these two filling plants from the Aberdeen proving grounds?

Gen. DICKSON. Well, South Amboy is just a little ways from Perth Amboy on the Raritan River, which empties into the lower harbor of New York City, and Mays Landing is down toward Cape May.

Col. SHINKLE. Between Atlantic City and Cape May.

Mr. BORLAND. Is it possible to drive from those two locations to the proving ground?

Col. SHINKLE. It is possible and practicable.

Mr. BORLAND. Is it done?

Col. SHINKLE. Steps are being taken by the department to institute a truck service to the Aberdeen proving ground which will touch a number of plants, including practically all of the munition factories in New Jersey, for the sake of speed in getting proof reports.

Mr. BORLAND. Who is doing this trucking to the Aberdeen ground now?

Col. SHINKLE. They truck from the Bartlett & Hayward plant and from an assemblage of plants in the vicinity of New Brunswick.

Mr. BORLAND. Those plants deliver completed shells?

Gen. DICKSON. Yes; I know that Bartlett & Hayward do.

Mr. BORLAND. When this truck service is inaugurated will it be inaugurated by your department as a part of your work?

Col. SHINKLE. It will be done as a part of the inspection division for the purpose of speeding up production and reducing the time between the completion of a lot and its acceptance or rejection, and it is done by us for the reason that with one truck service we can take care of a large number of munitions factories.

Mr. BORLAN. And you are going to expend some of your inspection money for these trucks?

Col. SHINKLE. For this truck which will make these trips.

Mr. BORLAND. And the personnel, of course?

Col. SHINKLE. Yes; the drivers will undoubtedly be enlisted men.

Mr. BORLAND. Is that embraced in the inspection cost of this item?

Col. SHINKLE. It is included as an item; yes, sir.

Mr. BORLAND. How much do you estimate that service is going to cost you?

Gen. DICKSON. An itemized estimate has not reached me, but we add 3 per cent to our estimates as a part of that service.

Mr. **Borland.** And then you have added 10 per cent for contingencies?

Gen. **Dickson.** Yes, sir.

Mr. **Borland.** And you include this as 3 per cent?

Gen. **Dickson.** Yes, sir.

Mr. **Borland.** How are they getting the loaded shells now from these two loading plants to the proving ground?

Col. **Shinkle.** They are getting them either by express or by private trucks and in various other ways. They send them through by fast freight and have a man ride in the car with them. A contractor will go to almost any expense to get quick results.

Mr. **Borland.** It is highly important that as soon as the shells are loaded and ready that they be tested.

Gen. **Dickson.** That is most important; yes.

Mr. **Borland.** So as to prevent delay in their being assembled for shipment abroad?

Gen. **Dickson.** Yes, sir.

Mr. **Borland.** And if there is anything wrong, you want to know it at the earliest possible moment?

Gen. **Dickson.** Yes, sir; and if they are all right we want to ship them.

Col. **Shinkle.** For two reasons we want to know that: The first reason is, of course, that we want to stop any bad production at the earliest possible moment, and the second reason is that accumulations of untested and unaccepted matériel in a factory is fatal to progress.

Gen. **Dickson.** As well as tying up money. Now, those items complete the deficiency estimate submitted in March of $272,500,000.

NITRATE PLANTS.

(See pp. 241, 267.)

I will now give you the rest of the items that go to make up this supplemental estimate. The first item in the supplemental estimate is the nitrate plants 3 and 4, $45,000,000.

Mr. **Borland.** There was some question whether you called them 3 and 4 or two divisions of 3.

Gen. **Dickson.** Yes; that has not been exactly settled.

Mr. **Borland.** How much is that?

Gen. **Dickson.** $45,000,000.

Mr. **Borland.** Are they similar to nitrate plant No. 1?

Gen. **Dickson.** No; they are similar to plant No. 2. We asked authority to duplicate nitrate plant No. 2, and it was diveded into two plants.

Mr. **Borland.** And is their product ammonium nitrate, the same as plant No. 2?

Gen. **Dickson.** Yes, sir.

Mr. **Borland.** And it is to be used for the high explosives to reduce the quantity of T. N. T. necessary?

Gen. **Dickson.** Yes, sir.

Mr. **Borland.** Those plants are located at Elizabethtown, Ohio, and——

Gen. **Dickson** (interposing). And Toledo, Ohio. They were located by the War Industries Board.

Mr. **Borland.** What is your next item?

Gen. DICKSON. The next item is for additional processes in connection with nitrate plant No. 1, which were explained by Col. Joyes yesterday, the amount being $15,982,000.

Mr. BORLAND. Is any part of this $15,982,000 to be used to reimburse the nitrate-supply fund or the President's $100,000,000 fund for any money which has been advanced from either of those funds for plant No. 1?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. How much?

Gen. DICKSON. $3,500,000.

Mr. BORLAND. From which fund?

Gen. DICKSON. The President's fund of $100,000,000 for the national security and defense.

Mr. BORLAND. Is anything going to be used to reimburse the nitrate-supply fund?

Gen. DICKSON. No, sir.

Mr. BORLAND. The statement was made from some source—I do not recall now what source—that all of the money that was not expended upon Muscle Shoals would be asked from Congress in these estimates to reimburse the $20,000,000 fund so that you could have it intact to prosecute the water-power work at Muscle Shoals.

Gen. DICKSON. The Ordnance Department has not received, to my knowledge, any instructions to ask Congress for any part of the funds that have been allotted to it out of the $20,000,000 to reimburse that fund.

Mr. BORLAND. General, it was explained, yesterday, that you thought the arc process still had some capabilities, in spite of the somewhat adverse report of Dr. Parsons. Do you think that those capabilities are promising enough to justify us in expending $5,000,000 on an experimental plant at this time?

Gen. DICKSON. Yes, sir; the principal reason being that you can erect and put into operation a plant using the arc process in much less time than a plant using any other process now known, and it is felt that the United States should possess all the knowledge that is necessary for utilizing that process in the emergency of the Chilean nitrate supply being cut off for any reason.

Mr. BORLAND. After you get your product by the arc process, it is not in a form in which you can use it for any process in making explosives, is it? You still have another process to go through before it is available for use in making explosives or in making anything else.

Col. SPRUANCE. Practically so. In this process for fixation of nitrogen you make weak nitric acid, and you may use this to make nitrate of ammonia or concentrate this to strong nitric acid and use that for the manufacture of powder instead of nitric acid produced from Chilean nitrate of soda.

Mr. BORLAND. Is the product all to be carried to that point in this experimental plant?

Gen. DICKSON. Yes, sir. It is for making a strong nitric acid.

Mr. BORLAND. General, how close have you figured in regard to being able to construct these plants according to the estimates?

Gen. DICKSON. It is considered that these estimates are sufficient, and there is no reason known to the department at the present time why each of these plants should not be completed within the amount asked for.

Mr. **Borland.** How were these estimates prepared? Were they prepared by men who had practical knowledge of building such plants?

Gen. **Dickson.** Yes, sir; in most cases. In some cases no plant of this kind has been put up, and in those cases we have had engineers give us as close an estimate as they could.

Mr. **Borland.** Of course, the result to the Government always is that if we start in on a project, having estimated it will cost so much, and find out later it will cost us a great deal more, we are practically committed to it anyway, and we usually go ahead regardless of the fact that we would not have authorized it in the first place if we had known the ultimate cost.

Gen. **Dickson.** Mr. Chairman, I can assure you that unless there is something most unforeseen which arises you will not be asked for another cent to complete any one of these plants. The present organization of the department is making a special effort to avoid that condition.

ADDITIONAL SHELL-FILLING PLANTS.

(See p. 288.)

Mr. **Borland.** What is your next item, General?

Gen. **Dickson.** The next item is for two additional shell-filling plants, $12,500,000. One of them is located at Penniman, Va., and the other at Hammonton, N. J.

Mr. **Borland.** Where is Hammonton, N. J.?

Col. **Spruance.** About the south-central part of New Jersey.

Mr. **Borland.** How are you getting along with those plants?

Col. **Spruance.** The Penniman plant ought to be loading shell in July, but the Hammonton plant has not progressed very far and probably will not be loading shell before the fall of this year.

Mr. **Borland.** However, both have been begun?

Gen. **Dickson.** Yes, sir. The Penniman plant will have a daily capacity of 25,000 75-millimeter shell; 12,000 155-millimeter shell; 4,000 8-inch or larger caliber shell; and 50,000 booster casings. The Hammonton plant has a capacity of 25,000 75-millimeter shell; 12,000 155-millimeter shell; 50,000 booster casings; 50,000 hand grenades; and 50.000 rifle grenades.

Mr. **Borland.** As to the capacity for hand grenades and rifle grenades, is that a proper charge upon this appropriation, A. of F. C?

Gen. **Dickson.** We thought so, sir.

Mr. **Borland.** Ought not a portion of that plant to be paid for out of the Army bill?

Gen. **Dickson.** We generally use the armament and fortifications money for handling and loading high explosives.

Mr. **Borland.** Of course, a proportion of that is paid for out of the Army bill.

Gen. **Dickson.** Yes, sir; the hand grenades themselves and the rifle grenades are made out of money appropriated in the Army bill.

Mr. **Borland.** How much of the capacity of the plant is represented by the hand grenade and the rifle grenade?

Gen. **Dickson.** About $500,000, sir. But that includes loading adapters and booster casings, as well as the grenades.

Col. Ragsdale. The booster is for artillery and trench warfare and would come legitimately under this item. The hand grenade part, I should say, offhand, would not cost more than $150,000. It is a very simple apparatus.

POWDER PLANT.

(See p. 240.)

Mr. Borland. What is your next item, General?

Gen. Dickson. The next item is $30,000,000 for the 200,000 pounds per day powder plant which we spoke of a while ago in connection with the $15,000,000 deficiency estimate.

Mr. Borland. And that plant you have not even located yet?

Gen. Dickson. No, sir.

Mr. Borland. So, of course, you have not spent any of that money?

Gen. Dickson. No, sir.

Mr. Byrns. It has not even been positively determined that you will build it?

Gen. Dickson. No, sir; it has not. We are awaiting information from Gen. Pershing.

AMMONIUM NITRATE PLANT.

Mr. Borland. What is your next item?

Gen. Dickson. Twelve million dollars for an ammonium nitrate plant being built at Perryville.

Mr. Borland. Where is Perryville?

Gen. Dickson. It is on the Susquehanna River, just across from Havre de Grace.

Mr. Borland. What is the nature of the process carried on there?

Col. Spruance. It is known as the direct or double decomposition process from which nitrate of ammonia is made, sulphate of ammonia (obtained largely from the by-product coke-oven process) and nitrate of soda producing ammonium nitrate and sulphate of soda.

Mr. Borland. Do you use both the sulphate of ammonia obtained from the by-product coke oven and sodium nitrate?

Col. Spruance. Yes, sir.

Mr. Borland. In the same process?

Col. Spruance. The two ingredients to produce the ammonium nitrate are sodium nitrate (Chilean nitrate) and ammonium sulphate.

Mr. Borland. Do you need the sodium nitrate in order to reduce the sulphate?

Col. Spruance. Yes, sir; to produce the amonium nitrate you have to have nitrogen in the form of sodium nitrate.

Mr. Borland. And therefore under that process you would have to have some sodium nitrate and that is not a process which is independent of your sodium nitrate supply?

Col. Spruance. No, sir.

Mr. Borland. Is there any process of reducing the ammonium sulphate that you get from the by-product coke ovens without the use of the sodium nitrate?

Col. Spruance. To convert ammonium sulphate into ammonium nitrate?

Mr. BORLAND. Yes.

Col. SPRUANCE. Not without the use of nitric acid or nitrate of soda or some other nitrate.

Mr. BORLAND. How far have you proceeded with that plant?

Col. SPRUANCE. That plant should be operating in July.

Mr. BORLAND. It has been started and is in course of construction?

Col. SPRUANCE. Yes, sir.

Mr. BORLAND. What do you expect its capacity to be?

Gen. DICKSON. At least 300 tons a day.

Mr. BORLAND. Three hundred tons of what?

Gen. DICKSON. Three hundred tons of ammonium nitrate.

SODIUM CYANIDE PLANT.

Mr. BORLAND. What is your next item, General?

Gen. DICKSON. $2,000,000 to cover the cost of a plant for making sodium cyanide, which is being erected for the Ordnance Department by the Bureau of Mines at Saltville.

Mr. BORLAND. For what process?

Gen. DICKSON. For making sodium cyanide for Col. Ragsdale's gas warfare.

Mr. BORLAND. For what purpose is that used?

Col. RAGSDALE. Mr. Chairman, that is used for the manufacture of certain toxic gases, and also to supply the French with sodium cyanide which they had previously purchased in this country made by a process involving the use of ammonia. We importuned the French to cancel that contract after the summer of this year in order to conserve ammonia, which was urgently needed for the explosives program. This plant is being erected and will be operated by Dr. Parsons, and the process involved is very closely allied to the one we were talking about for the fixation of atmospheric nitrogen. Sodium cyanide, of course, is used in the manufacture of toxic gases.

Mr. BORLAND. How far has that gotten along?

Col. RAGSDALE. They have made a great deal of progress down there. Exactly the percentage of completion I do not know. I know that at present they are hung up for lack of steel, but the bulk of the work has been completed, and I am confident we will have deliveries by the end of July.

TOLUOL.

Mr. BORLAND. What is your next item, General?

Gen. DICKSON. The next item is for producing toluol, $52,000,000. That is made up of different items. One item is $40,000,000 to cover the erection of 1,000 by-product coke ovens, which have got to be financed in order to get the product.

Mr. BORLAND. That is $40,000 an oven?

Gen. DICKSON. Yes, sir; that is what it is costing. Sometimes they get by for less. It costs anywhere from $35,000 to $40,000, and occasionally it will run a little over, but the best information we have been able to get is that we are safe in asking you for $40,000 per oven, and we will not have to ask for any more.

We want $2,000,000 for putting scrubbing apparatus into gas plants. We expect to obtain 1,000,000 gallons of toluol a year by that process. The other item is $10,000,000 for plants for cracking the California petroleum, by which method we expect to obtain 5,000,000 gallons of toluol per year.

Mr. BORLAND. General, in reference to this $40,000,000 investment in these 1,000 by-product coke ovens, under what arrangement is that done with the owners of the ovens?

Gen. DICKSON. I would suggest, Mr. Chairman, that you ask Col. McRoberts to give you the details of those contracts, as he is handling that matter. I know that to obtain these additional 1,000 ovens he said he would have to have about $40,000,000 to advance to those companies.

Mr. BORLAND. And he also knows the details about the scrubbing apparatus in gas plants and the plants for cracking petroleum?

Gen. DICKSON. Yes, sir.

TRINITROTOLUOL PLANT.

Mr. BORLAND. What is the next item?

Gen. DICKSON. The next item is $17,000,000 for the construction of a T. N. T. plant having a capacity of about 140,000,000 pounds of T. N. T. per year.

Mr. BORLAND. Where is that to be located?

Gen. DICKSON. That has not been located as yet. As we increase the output of toluol from these different sources, then there will have to be erected plants for converting the toluol into T. N. T., and that is what this $17,000,000 is to cover.

Mr. BORLAND. A large amount of T. N. T. is now made by private manufacturers?

Gen. DICKSON. Yes, sir. We have increased the output of all those plants to the limit.

Mr. BORLAND. Are they financed by Government money?

Gen. DICKSON. Some of them have been. The plants now making T. N. T., with their capacities, are as follows: The Aetna Explosive Co., at Carnegie, Pa., has a capacity of 800,000 pounds per month. That company had a plant at Oakdale, Pa., with a capacity of 2,000,000 pounds per month.

Mr. BORLAND. That is the one which was destroyed?

Gen. DICKSON. Yes. The British Chemical Co. has a plant in Trenton, Canada, having a capacity of 1,500,000 pounds per month. The Canadian Explosives Co. has two plants in Canada that have a capacity of 2,000,000 pounds per month as the total for the two. The Du Pont Co. has a plant at Barksdale, Wis., having a capacity of 3,500,000 per month. The Federal Dye Stuffs & Chemical Co. has a plant at Kingsport, Tenn., with a capacity of 400,000 pounds per month. The Grasselli Chemical Co., at Newcastle, Pa., has a capacity of 1,000,000 pounds per month. The Hercules Powder Co., at Hercules, Cal., has a capacity of 3,000,000 pounds per month, and the same company at Kenvil, N. J., has a plant with a capacity of 500,000 pounds per month. The Nitro Powder Co., at Kingston, N. Y., has a capacity of 500,000 pounds per month. The Semet-Solvay Co., at Split Rock, N. Y., has a capacity of 750,000 pounds per month, making a total of 15,950,000 pounds per month.

Mr. BORLAND. And you expect to add how much additional capacity?

Gen. DICKSON. We expect to add 140,000,000 pounds per year.

Mr. BORLAND. How much additional capacity is that? The other figures were on a monthly basis.

Gen. DICKSON. About 12,500,000 pounds per month.

Mr. BORLAND. You expect to about double it?

Gen. DICKSON. Yes; but not quite.

Mr. BORLAND. Is this estimate of $17,000,000 made on the basis of your producing that 12,000,000 pounds?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Does it mean one plant or more than one plant?

Col. SPRUANCE. It will probably be divided between not less than two and possibly as many as five plants. There are eight possible locations under consideration which are now up for general consideration as to locality, i. e., whether they are within permissible districts, by the War Industries Board. There have been no contracts negotiated for this capacity at all.

ACID TANK CARS.

Mr. BORLAND. What is your next item, General?

Gen. DICKSON. There is one item of 1,000 acid tank cars, $4,500,000. We tried to get the Director General of Railroads to finance that for us, but we could not do it.

Mr. BORLAND. For what purpose are these acid tank cars to be used?

Col. SPRUANCE. They are to be used to transport acid to the nitrate and explosive plants in order to utilize to the maximum the existing acid-producing facilities, so as to avoid the erection of new acid capacity without utilizing existing capacity.

Mr. BORLAND. What kind of acid?

Col. SPRUANCE. Sulphuric acid almost exclusively.

Mr. BORLAND. You have to have special cars to transport that?

Gen. DICKSON. Yes, sir; and there are not enough in the country.

Mr. BORLAND. How are you going to transport your nitric acid?

Col. SPRUANCE. Nitric acid is seldom transported. If it is transported, as Col. Joyes explained yesterday, it is in the form of strong mixed acid; that is, strong nitric acid, to which an amount of sulphuric is added, which can be transported in iron. Weak nitric acid ordinarily has to be transported in glass, and for that reason is seldom transported in quantity. There is no existing spare capacity for nitric acid in this country. The spare capacity is sulphuric acid.

Gen. DICKSON. The cost of these items in the supplemental estimate is $190,982,000. Then you made a contract authorization in the urgent deficiency act of March 28, 1918, of $80,725,000. That has been obligated and therefore we are including that now in the form of cash.

Mr. BORLAND. What did you do with that money, General?

Gen. DICKSON. I would like to get up a statement and submit that to you later.

ALLOTMENTS TO GEN. PERSHING.

The next item is allotment made to Gen. Pershing, $148,000,000. Those allotments have been made out of previous appropriations and we have not been able to order the things that we should because we took that money and allotted it to him.

Mr. Borland. Do you know what he uses it for or what he expected to use it for?

Gen. Dickson. The purchase of artillery ammunition.

Mr. Borland. Ought not that to represent a credit on his general program? If he has bought that much himself is not that a credit on what he is asking you to buy on the whole program?

Gen. Dickson. I think that view might be taken in the case of ammunition, although, as stated, in the case of the guns, carriages, etc., we were told to include whatever he bought over there in these estimates. I want to check that up and see.

Mr. Borland. We do not want to take that for granted until we know, and you might look into that.

Gen. Dickson. I will do so. The next item was $144,492,000 which has been reserved on our books, by a cablegram from Gen. Pershing, stating that he will want that amount to cover some additional purchanses he has made.

Mr. Borland. Additional purchases of field ammunition?

Gen. Dickson. Yes, sir.

Mr. Borland. And that same remark would apply to that?

Gen. Dickson. Yes, sir; and also to the next item, to cover the cost of raw materials, which he will call upon the department to furnish the French and British.

Mr. Borland. How much is that?

Gen. Dickson. $108,369,000. We will check those three items and give you a report to-morrow.

LEASING OR PURCHASING LAND AND EQUIPMENT FOR TEMPORARY PROVING GROUNDS.

(See pp. 216, 218.)

The next item is for the leasing or purchasing of land and providing equipment for temporary proving grounds, $2,000,000. That is for the purpose of providing facilities necessary for testing ammunition, the same as the item I explained the other day of $4,000,000 for proof-firing guns, carriages, etc.

Mr. Borland. Are they not combined? Do you not test the ammunition at the same proving ground at which you test the guns?

Gen. Dickson. In a great many cases we will, but the appropriations read for the manufacture, purchase, and test, one of guns, carriages, etc., and the other of ammunition.

Mr. Borland. In practice you combine those two, do you not?

Gen. Dickson. Yes.

Mr. Borland. So that gives you $6,000,000?

Gen. Dickson. $6,000,000 is the total; yes.

Mr. Borlan. Which will be expended upon the same proving ground?

Gen. Dickson. Yes, sir.

Mr. Byrns. Is it the idea to purchase land for these temporary proving grounds?

Gen. Dickson. The policy of the Ordnance Department has been find which was to the best interest of the Government, to lease d or to purchase it.

Mr. BYRNS. Well, if it is possible to lease it at anything like a reasonable price I do not think there would be any question about it, because you will only need it for a comparatively short time.

Gen. DICKSON. Exactly, and that is our policy. If we can lease the land at a reasonable rate, taking into consideration the probable duration of the war, and if what we pay for the lease is less than the cost of the land then we lease it, but if we could buy the land for less than we could lease it then we would do that.

Mr. BYRNS. That is the reason you want authority to lease or purchase?

Gen. DICKSON. Yes, sir; so as to drive the best bargain we can.

INSPECTION, ADMINISTRATION, CONTINGENCIES.

The final item is inspection, administration, contingencies, etc., $540,278,887.

Mr. BORLAND. What percentage of that is inspection?

Gen. DICKSON. Three per cent.

Mr. BORLAND. How much for administration?

Gen. DICKSON. For procurement or purchasing about 2 per cent, production about 2½ per cent, and engineering about 2 per cent.

Mr. BORLAND. Does administration include your executive office here in Washington?

Gen. DICKSON. Some of the expenses. There are certain employees, a very limited number, that are appropriated for directly in the legislative, executive, and judicial bill. Then there is an act that authorizes employment except for clerical positions. That was principally intended to cover draftsmen, etc., up to a certain amount; but there is a limit on that, and they can be paid out of the manufacturing appropriations. Then there is another act that permits the employment of necessary services, except clerical, out of the manufacturing appropriations. In so far as the legislative, executive, and judicial bill does not cover the office force they are paid out of these other appropriations.

Mr. BYRNS. That simply applies to your clerical force and, as I understand it, the statute prohibits you from applying any part of your lump-sum appropriation to the payment of clerical services in the District.

Gen. DICKSON. Yes, sir; but we have a number of experts; we have been obliged to get them, and they are paid out of this.

Mr. BORLAND. Is that what is covered by this item?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Your commissioned officers are paid according to their rank out of the Army bill?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. That is not charged to this manufacturing appropriation?

Gen. DICKSON. Not at all. The only thing that is ever paid out of the manufacturing appropriations would be in case you ordered an officer to travel. The only payment that can be made to a commissioned officer out of any manufacturing appropriations is his traveling expenses when he performs a journey under competent orders.

Mr. BORLAND. Give me, in amount, how much you expect to spend out of this $540,000,000 for these administration expenses.

Gen. Dickson. Approximately the percentages I have previously given.

Mr. Borland. You gave the percentages, but I did not take them down.

Gen. Dickson. Inspection is about 3 per cent; production, 2½ per cent; engineering, 2 per cent; and procurement, 2 per cent.

Mr. Borland. You have inspection in here. I am asking what is included under the head of administration. Does that include production and procurement?

Gen. Dickson. Yes, sir; and probably one-half per cent for the office of the Chief of Ordnance.

Mr. Borland. The percentages you have given—2 per cent, 3 per cent, etc.—are figured on the gross amount of the ordnance?

Gen. Dickson. Yes, sir.

Mr. Borland. You do not figure them upon the amounts that are appropriated for the erection of plants, the establishment of proving grounds, and things of that sort?

Gen. Dickson. Yes; and also the expenses connected with them.

Mr. Borland. How do you figure them?

Gen. Dickson. Say you want to put up a plant. The Chief of Ordnance will send some of his expert officers out to look over various sites; he has to pay their traveling expenses out of this appropriation; or he may have to hire a firm to draw up building plans in some cases, and their expenses would be paid.

Mr. Borland. You are prohibited by statute from employing any clerical services in the District of Columbia?

Gen. Dickson. We are obeying that statute, and we do not employ clerks out of this.

Mr. Borland. Of course, you do not pay your commissioned personnel out of this, except their traveling expenses.

Gen. Dickson. That is all.

Mr. Borland. How large a force do you pay out of this? Can you give the committee any idea as to the size of the force you pay out of this?

Gen. Dickson. I could not now, sir; but I can give you a list showing, if you wish, the number of persons in each profession or trade, with the pay.

Mr. Borland. You have added 10 per cent for contingencies, have you?

Gen. Dickson. Yes; you formerly gave us 10 per cent on the estimated cost of the various items to cover contingencies. We have increased that practically by 15 per cent, because we are asking you for 25 per cent, and that is what this item is.

Mr. Borland. This item is 25 per cent of your total estimate?

Gen. Dickson. Yes, sir.

Mr. Borland. Twenty-five per cent of the total cost of each one of these plants?

Gen. Dickson. Yes, sir.

Mr. Borland. Added in as practically a contingent item?

Gen. Dickson. Yes, sir. There is another thing. We are constantly called on for new items which are not in here.

Mr. Borland. But you do not want a fund to take care of those items? In other words, we could not give you a lump sum under the name of contingencies which you could apply to totally new objects?

Gen. **Dickson.** I think you could. For instance, here is a new item that just came up the other day. For the 37-millimeter gun, Gen. Pershing wants a 20-ounce high explosive shell, and also for the 155-millimeter gun he wants a very high capacity thin-walled shell. When they cable over and say they want those things, we have got to jump right in and get them. It is exceedingly hard under present conditions to figure out mathematically just exactly what you are going to require. It is impossible.

GENERAL CONTRACT AUTHORIZATION.

(See pp. 230, 312, 315.)

Mr. **Borland.** I notice that the Secretary of War has asked one billion dollars in a general contract authorization.

Gen. **Dickson.** Yes, sir.

Mr. **Borland.** Of which you are asking $500,000,000.

Gen. **Dickson.** Yes.

Mr. **Borland.** And we are to give you one-half?

Gen. **Dickson.** Yes, sir.

Mr. **Borland.** And the Army bill is to give you one-half?

Gen. **Dickson.** Yes, sir.

Mr. **Borland.** The language is:

> The Secretary of War is authorized, during the present emergency, in addition to the appropriations and obligations specifically authorized by law, to incur obligations for ordnance and ordnance supplies and materials: *Provided,* That the aggregate amount of such obligations outstanding at any one time shall not exceed the sum of $1,000,000,000.

That is in addition to all appropriations and obligations authorized by law?

Gen. **Dickson.** Yes, sir.

Mr. **Borland.** That would be a pretty big leeway in itself?

Gen. **Dickson.** Yes, sir. I think you might cut this a little bit, although we thought the uncertainty of the situation justified our asking for 25 per cent.

Mr. **Borland.** I think that we ought to have an inspection and administration item as to the program for field ammunition; as to the program for building operations I am not so clear, because 25 per cent added to the estimated cost of these plants is a very important item. You have in addition to that this blanket authorization, one-half of which is to be provided for in this bill.

Gen. **Dickson.** We meet with many expenses in connection with putting up new plants.

Mr. **Borland.** With an appropriation of $540,000,000 you could put up a great many plants, just out of that one item alone, because that is a big item.

Gen. **Dickson.** That is right; but you can see what we have had to do in the last few months.

Mr. **Borland.** When you come to the cost of the plants you take out of the construction account your expenses of inspection, your supervisory costs, and your contingencies? They are all charged to the construction account as long as the construction is going on, are they not?

Gen. DICKSON. We can do that; yes, sir.

Mr. BORLAND. This item of inspection, administration, and contingencies is $540,000,000?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. And then you have in this bill an item of $500,000,000 for general contract authorizations, outside of every specific item; together that makes $1,040,000,000, all of which is practically for contingencies?

Gen. DICKSON. Yes, sir. A contract authorization is not money, but is merely authority to enter into a contract for furnishing material. You could not pay any contingent expenses out of that.

Mr. BORLAND. Is that the last item?

Gen. DICKSON. Yes, sir; that adds up $2,701,394,437.

Mr. BORLAND. Did you say you had some other additional items in addition to the $27,000,000 item?

Gen. DICKSON. No, sir; not now.

FRIDAY, MAY, 24, 1918.

Mr. GOOD. General, will you insert in the record a list of the plants constructed or under construction or which it has been decided by the War Department to construct for which no specific authority of Congress has been granted, giving the name and location of each plant, the thing to be produced therein, the estimated cost of each plant; or, if constructed, the actual cost, the amount constructed to date, the date when it was decided by the War Department to construct the same, the date when work upon the plant was commenced, and the date upon which it was proposed to complete the plant?

Gen. DICKSON. Very well, sir.

SHELL-FILLING PLANTS.

(See p. 279.)

Mr. BORLAND. It is proposed by your department to submit another estimate of $27,000,000, which is not yet embraced in any of these estimates that have come to the committee. What is the explanation of that new estimate?

Gen. DICKSON. The supplemental estimate included four shell-filling plants at an estimated cost of $25,000,000. Work on those plants has advanced sufficiently to indicate that the total cost will be $28,000,000 instead of $25,000,000. The additional estimate will, therefore, include $3,000,000 to insure the completion of those four plants. The supplemental estimate included a new T. N. T. plant —— at an estimated cost of $17,000,000. In explaining the supplemental estimate yesterday under this item I incorrectly stated the estimated capacity of that plant ——. That is to be the total capacity of that plant, and the $17,000,000 is the cost of the plant for —— pounds per year, which was the capacity that was thought sufficient. That was later found from the increased requirements to be insufficient, and so it will take $8,000,000 more to complete that plant to its full capacity.

Mr. BORLAND. Is that for the completion of one plant or for the erection of a new plant or new unit?

Gen. DICKSON. That plant has not yet been ordered. As we explained yesterday, there will undoubtedly be two and possibly four plants, and they are to be put up as fast as the increase in toluol comes in. One of those at least should be started immediately.

Mr. BORLAND. That is $8,000,000?

Gen. DICKSON. Yes, sir. During the explanation of the supplemental estimate yesterday it was stated that a very careful survey of the field of explosives had been made, and that it was found practicable to use nitrostarch and another explosive which we call E. L. 104 in grenades, in drop bombs, and in other similar high-explosive projectiles. The substitute explosives adopted cost very much less than T. N. T. For example, as was explained yesterday, T. N. T. will cost on an average 44 cents a pound, whereas ammonium nitrate will run from, say, 10 to 15½ cents, and by using as much ammonium nitrate with T. N. T. as will give effective results you reduce the cost of your bursting charge to approximately 22 or 23 cents per pound. Nitrostarch and E. L. 104 are very cheap, but it will be necessary to increase existing plant facilities to produce the required quantity of these substitute explosives, and the estimated cost of those additional facilities is $10,000,000.

Mr. BORLAND. I got the understanding yesterday from your testimony that it was ammonium nitrate which you used as a substitute for T. N. T., and that that was being produced at these nitrate plants that you have already started. Are you expecting to start a plant for these other substances, and are they different in kind?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. And require a different plant?

Gen. DICKSON. A different process entirely.

Mr. BORLAND. Will that mean a new plant?

Gen. DICKSON. It means additions to existing plants?

Mr. BORLAND. It is not a part of the work carried on at any of the existing plants?

Gen. DICKSON. No, sir. There are some plants that are producing nitrostarch and E. L. 104, but their present capacity is inadequate.

Mr. BORLAND. You mean private plants?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. There are no Government plants?

Gen. DICKSON. No, sir.

Mr. BORLAND. That plant, I suppose, has not been located or begun?

Gen. DICKSON. It has not been touched, sir. * * *

Mr. BORLAND. Then do you contemplate not only the erection of a Government plant to produce these explosives, but also the increase of facilities in private plants at Government expense?

Gen. DICKSON. If private plants are not financially able to make the increase themselves then there is no alternative but for the Government to finance the increase.

Mr. **Borland**. How much of this $10,000,000 is to be devoted to the increase of facilities in private plants and how much to the erection of a new Government plant?

Gen. **Dickson**. Approximately nine forty-fourths to the increase of existing plants and thirty-five forty-fourths for new plants.

Mr. **Borland**. Practically one-fifth and four-fifths?

Gen. **Dickson**. Yes.

Mr. **Borland**. Does the Government own or enjoy the right to use this process for making these particular explosives?

Gen. **Dickson**. I would like the privilege of having an expert answer that question. There may be some patent rights that I do not know about.

HOUSING FACILITIES FOR EMPLOYEES AT NITRATE PLANTS.

Mr. **Borland**. What is your next item?

Gen. **Dickson**. It is necessary to provide housing facilities for employees at nitrate plants Nos. 1, 2, 3, and 4. Fewer houses will be required at No. 1 than at No. 2, but of a more permanent type, as this is to be a permanent establishment. Therefore the same amount has been asked for each. For Nos. 3 and 4 I have not definite data, as they have not been fully planned. We hope to have less housing to build, but have felt obliged for safety to ask the same amount, $2,000,000. So there was an item of $6,000,000 inserted for plants Nos. 1, 2, 3, and 4 for that purpose. The housing facilities at Nos. 1 and 2 we know about. On the original site recommended for the single No. 3 plant housing facilities would have been required. That plant was subsequently divided into two, and one located at Toledo and the other at Elizabethtown, Ohio, and the necessity for housing facilities is now being investigated.

Mr. **Borland**. What class of housing do you expect to put up? What are your plans about that?

Gen. **Dickson**. The Ordnance Department endeavors to arrange the housing along one of two lines. In some cases private plants will agree to reimburse the Government for the housing at a certain rate per year, so that in the end the Government will get its investment back; in other cases cities have arranged to amortize houses built in them in such a way that the Government gets its original investment back. The department in one case obtained two hotels that were not being used.

Mr. **Borland**. Then I take it you have already entered upon this plan of providing housing facilities?

Gen. **Dickson**. We have made no contracts for the housing facilities in the item under discussion.

Mr. **Borland**. But do we understand you have provided housing facilities in prior cases?

Gen. **Dickson**. In some cases; yes, sir.

Mr. **Borland**. Where does that appear in the estimates? Is that included in the cost of the construction of the plant?

Gen. **Dickson**. As a part of the cost, but separately. There are some contracts that provide for the construction of plants and also separate provisions providing for certain housing facilities.

Mr. **Borland**. Then I wish you would add to the statement which you are to prepare a statement showing how much of the sum is devoted to housing facilities and under what arrangement.

War Department,
Office of the Chief of Ordnance,
May 25, 1918.

From: Capt. H. S. Kimball, nitrate engineering.
To: Capt. Gaillard, nitrate general control.
Subject: Housing data—Nitrate plants.

Plant No.—	Number of employees.	Type of house.	Cost.
1	1,000	Permanent houses; as this plant, it is assumed, will be one of the regular ordnance reservations; upon which will be quartered many officers, technical men, experts, and high-grade operatives. Very few frame houses are being built, and those are to be stucco finish; balance, hollow tile with stucco finish. The village will include a schoolhouse, stores, a hall, playgrounds, etc., and the water, sewers, lights, etc., are included, as well as the streets and landscape architectural features	$2,000,000
2	3,000 to 4,000	Houses of more temporary type than those of No. 1. All are wooden frame with wooden siding. This cost does not include sewers, water, lights, and streets	2,000,000
3 and 4	3,000 to 4,000	Houses for these plants similar to No. 2 at $1,000,000 per plant	2,000,000
			6,000,000

H. S. Kimball,
Capt., Ord. R. C.

Gen. Dickson. I should like to state that the Ordnance Department has embarked on the matter of housing facilities with great reluctance and only when the obtaining of necessary production has forced it to do so. There has been great pressure brought on the department from many quarters to embark on housing propositions, but the department has consistently resisted it.

Mr. Borland. What price houses do you build?

Gen. Dickson. The houses, as a rule, are of the very cheapest kind and temporary in character, but where the contract provides that the Government is to be reimbursed for its investment more permanent structures have been built.

Mr. Borland. Are they single houses or barracks?

Gen. Dickson. Bachelor barrack hotels have been built to the fullest extent that would take care of the needs. Individual houses have been resorted to only where it was demonstrated that they were necessary to retain high-grade skill. In some plants they have not been able to retain, for instance, gauge and tool makers because they would not stay unless they could have houses for their families, and as gauge and tool makers are essential to production there was no alternative but to provide these quarters.

Mr. Borland. General, when you say that in some cases, where you have a contract for reimbursement, you have put up a little better class of houses, because the United States is going to get its money back. What sort of security is back of those contracts to guarantee that those people will amortize the cost or take the houses off the Government's hands?

Gen. Dickson. The bond attached to the contract.

Mr. Borland. There is such a bond?

Gen. Dickson. In two contracts that I examined there were bonds. Col. McRoberts could give you the details about that.

Mr. **Borland.** Is that under Col. McRoberts's division?

Gen. **Dickson.** Yes, sir.

Mr. **Borland.** You have solved this housing problem for yourselves without waiting for the Labor Department?

Gen. **Dickson.** Sir, that is quite a complicated problem. The Ordnance Department was fortunate enough to obtain the services of Dean Schneider, who is probably one of the best-known and most efficient industrial managers in this country. When all labor matters were placed under the Secretary of Labor we immediately had Dean Schneider report to him and keep in touch with him and apply his rules to the Ordnance Department.

Mr. **Borland.** I am not criticizing that. I am rather inclined to think that you gentlemen who are charged with the duty of constructing a factory and getting it running and producing the goods can handle the problem better as a part of the construction of the factory than it could be handled by any outside department of the Government. I think you will save time and probably save cost, and undoubtedly you reach the spot quicker and better and with less conflict of opinion as to what you want. I do not criticize that and I was just inquiring what, if any, relation there was between your department and this new housing bill which has been put in charge of the Labor Department.

Gen. **Dickson.** As soon as the bill was introduced into the Congress to provide housing facilities, the Ordnance Department immediately assumed that it should not provide housing, as apparently if that bill were enacted it would clearly show that it was the will of the Congress that the Ordnance Department should not go into the housing problem, Congress having charged some other department with it. But the bill did not pass for some time, and there were cases where the plant had raw materials and machines and everything except labor, and in those cases we made a very careful and detailed study. We did not take the representations of the contractor nor listen to the urgings of people in the vicinity: but Dean Snyder has a number of experts who surveyed each case. Sometimes the situation was either entirely or partially relieved by obtaining better transportation facilities. The Director General of Railroads has been very kind and has saved housing facilities in some cases by providing transportation by steam railroads. In some cases the trolley lines have been persuaded to make changes which have relieved a particular situation in part or in whole. In other cases it was simply impossible to get the necessary employees except by providing housing facilities, but we have kept them at the very minimum for a number of obvious reasons.

Mr. **Borland.** General, do your arrangements provide for any rent to be paid by your employees for these houses?

Gen. **Dickson.** Yes, sir.

Mr. **Borland.** Is that true in all cases, or is the housing sometimes given as a part of the compensation?

Gen. **Dickson.** In the case of individual houses I am certain that they charge a rent comparable with what obtains in the vicinity for the same kind of house. I am not sure about all cases in the barrack hotels, but I am pretty sure they charge there. Col. McRoberts can give you the details of those contracts.

Mr. BORLAND. What becomes of that money? It is covered into the Treasury as miscellaneous receipts, is it not?

Gen. DICKSON. Our financial and leading lights are working on that problem, and we assume it will be; at least that is my opinion.

Mr. BORLAND. Is that under Col. McRoberts's division?

Gen. DICKSON. I think that would come under general administration as being the construing of law. But under existing law I am positive all these rents that are collected will have to be deposited to the credit of the Treasury.

Mr. BORLAND. General, do you run any commissary or furnish any subsistence or anything of that kind in connection with the construction or operation of these plants?

Gen. DICKSON. The department does not do it directly. It may be that some of the contractors do, but it is my understanding that no Government funds are used for that purpose. Now, it is possible it might be in some cases, but in none that I know of, sir.

Mr. BORLAND. Have you ever had any trouble about extortion by local merchants?

Gen. DICKSON. I have heard complaints occasionally that such was the case, but I think in most cases where they have to provide messing that is due to the isolation of the plant. For instance, I know in two cases where we authorized these bachelor barrack hotels it was necessary to arrange a dining room and kitchen, and it was my understanding that they were going to let the contract to some catering firm to run the messing part of it with complete supervision.

Mr. BORLAND. Your estimate here of $6,000,000 is for housing at nitrate plants Nos. 1, 2, 3, and 4. This is extra housing beyond what you provided out of the construction fund.

Gen. DICKSON. This is to cover all the housing that is to be provided at those plants, separately.

Mr. BORLAND. Do we assume, then, that your housing at the other plants has been taken case of with your construction fund?

Gen. DICKSON. Such as we have provided so far.

Mr. BORLAND. How did it happen that you made a separate item of this particular housing?

Gen. DICKSON. Plants 3 and 4 have not yet been started. Plants 1 and 2 are nearing completion, and the necessity for the houses to go there is not yet acute, but will become so in a very short time. As the plants come into production, then the additional force will have to be collected, and the housing facilities asked for are for taking care of the additional employees for which housing facilities do not now exist.

Mr. BORLAND. How many employees do you expect to take care of for $6,000,000?

Gen. DICKSON. At plant No. 1 about 1,000, some of them being officers entitled to public quarters. Permanent construction become a permanent station. At plant No. 2 about 3,000 to 4,000, and at plants Nos. 3 and 4 together about 4,000. In all, say 9,000, including officers and enlisted men entitled to public quarters.

Mr. BYRNS. Can you also tell us, General, how much of that fund it is expected will be used to provide housing facilities at plants Nos. 3 and 4? I understood you to say a while ago it had not been fully determined as to whether you would need them.

Gen. Dickson. That is correct.

Mr. Byrns. Therefore, we would like to know how much of the fund you have estimated for plants 3 and 4.

Gen. Dickson. Two million dollars, only so much of which as is necessary will be used.

PURCHASE OF 12-INCH GUNS.

Mr. Borland. What other items have you?

Gen. Dickson. That is all, except there is a small item which I spoke about day before yesterday in reference to the 12-inch guns which we are going to buy. There will be an item there for about $180,000.

Mr. Borland. Is that under B?

Gen. Dickson. No, sir; that will be under C, for the ammunition to come with these guns. We have not submitted that yet, but day before yesterday the Chief of Ordnance told me to proceed immediately with the purchase of six 12-inch guns which the Bethlehem Steel Co. had practically completed ——, and we are now trying to find out exactly how much ammunition has been made for those guns and what we have got to pay, so as to include it in this additional supplemental estimate.

Mr. Borland. The cost of buying those guns is not included in any estimate yet?

Gen. Dickson. No, sir; that will come in under B.

Mr. Borland. In case a purchase of those —— guns is made, how much will it amount to?

Gen. Dickson. I would like to insert the exact amount later.

Mr. Borland. Are they 12-inch guns?

Gen. Dickson. Yes, sir; six 12-inch guns and barbette carriages. There is some ammunition, and we will have to purchase the entire outfit.

Mr. Borland. The ammunition comes with the guns?

Gen. Dickson. Yes, sir. Then we will make three railway mounts and one service car and store the barbette carriages, so that when the war is over the barbette carriages can then be installed in our fortification program and the guns mounted on them.

MACHINERY NECESSARY FOR MANUFACTURE.

Mr. Borland. General, in the wording of the present law under this item there appear the words "machinery necessary for its manufacture at the arsenals." In the recommendation made this year those words are cut out. In discussing this matter with Gen. Ri as to this and some other proceeding items he said that was a mistake; that the department did not want all those words cut out; that they wanted the words "at the arsenals" cut out, leaving in the words "machinery necessary for its manufacture."

Gen. Dickson. Yes, sir.

Mr. Borland. You want to use this manufacturing appropriation, therefore, for machinery necessary for the manufacture of ammunition, without regard to whether it is installed in Government plants or at private plants; is that your intention?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Can you give the committee any idea as to how much machinery you expect to install in private plants? I do not discover that here in any of your itemized statements.

Gen. DICKSON. I can not do so now, sir. There has been a careful survey made of existing plant facilities, and in placing new contracts an effort is made to use existing facilities to the fullest extent. It is often necessary to supplement existing facilities sometimes with an additional building, sometimes with additional machines, as the machine-tool equipment in the plant may be lacking, certain machine tools that are necessary to produce the article, and it is desired to strike out the words "at the arsenals" so that this money can be used without any question to buy such additional machines. Of course, when additional machines are bought and put in a plant they are the property of the United States.

Mr. BORLAND. And the purpose of this change of language is to enable you to buy this machinery and put it in private plants?

Gen. DICKSON. Yes, sir; or to put it in a plant constructed by the Government.

STORAGE FACILITIES.

Mr. BORLAND. You also have some new language in here—the words "necessary storage facilities." What is meant by that?

Gen. DICKSON. When you are manufacturing on a large scale it is necessary to have a considerable quantity of raw material at these plants so that when railroad traffic or transportation is interrupted, as it was in December and January last, your plant will not run out of raw material and production stop. Also, where your output is large you have to have storage space sufficient to hold the output in lots long enough to know that the material is accepted and also boxing and crating space. Then we have to be very careful now to make all shipments in carload lots wherever it is possible to do so, and you can not always get the required number of cars each day; but your product must come through the plant continuously and regularly, and therefore it is necessary to provide more storage space at some plants than before. Some of this storage space is to be provided at private plants and also at plants put up by the Government, depending upon the particular conditions.

Mr. BORLAND. Do you expect to build any permanent warehouses for ordnance storage except what you have described here in connection with these various plants for caring for the raw material and products?

Gen. DICKSON. No, sir.

Mr. BORLAND. Are you going to build any terminal storage for ordnance or anything of that kind the same as the Quartermaster Department?

Gen. DICKSON. The Construction Division now provides storage facilities at each port of embarkation sufficient to hold one month's supply of all articles supplied by it. Then it has to have what are known as interior warehouses in different centers, so that material from the manufacturing plants can go directly to these central or interior depots and be collected in those depots and then sent in trainloads to the ports of embarkation. We are making these estimates and the facilities at the ports of embarkation are provided by the Quartermaster Department.

Mr. BORLAND. They are not provided for out of this fund?

Gen. DICKSON. No, sir.

Mr. BORLAND. They are under the ordinary item for barracks and quarters disbursed by the Quartermaster General?

Gen. DICKSON. We submitted separate estimates for these storage facilities. There is about $20,000,000 under the ordnance service in the Army bill operating expenses at terminal facilities and interior depots.

Mr. BORLAND. You submitted that in the Army bill, and the sundry civil bill carries the ordinary item for the construction of barracks and quarters, which includes warehouses?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Why are not these storage facilities provided for and included in the sundry civil items?

Gen. DICKSON. Funds for operation of terminal storehouses and interior depots are appropriated under "Ordnance service," as such work is "receiving, storing, and issuing ordnance and ordnance stores." A comparatively small sum out of "Ordnance service" has been used for constructing warehouses, which appropriations were made in the urgent deficiency acts of June 15, 1917, and October 6, 1917, both of which bills were prepared by the Appropriations Committee. It is understood that terminal storehouses and interior depots are now being built by the construction division out of funds appropriated in the sundry civil bill.

ALTERATION AND MAINTENANCE OF MOBILE ARTILLERY, ETC.

(See p. 303.)

Mr. BORLAND. I think the next item is what you call the A. of F. "L." for the alteration and maintenance of the mobile artillery.

Gen. DICKSON. Yes, sir; for alteration and maintenance of mobile artillery, including the purchase and manufacture of machinery, tools, and materials necessary for the work and the expenses of the mechanics engaged thereon.

Mr. BORLAND. That is what you call the A. of F. L.?

Gen. DICKSON. Yes, sir. For the item on page 55, for alteration and maintenance of the mobile artillery, including the purchase and manufacture of machinery, tools, and materials necessary for the work and the expenses of the mechanics engaged thereon the estimates were $323,683,834.

Mr. BORLAND. You had an original estimate, according to your statement here, of $323,243,000, and according to my book it is $310,500,000.

Gen. DICKSON. I looked into that, and the original estimate of $310,500,000 should stand.

Mr. BORLAND. It should stand?

Gen. DICKSON. Yes, sir. The difference has been included in this supplemental estimate, so that the $310,500,000 should stand.

Mr. BORLAND. Now, you call this the A. of F. L item?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. General, what are your items included in that original estimate of $310,500,000?

Gen. **Dickson**. The original estimate has not yet been explained to you?

Mr. **Borland**. No.

Gen. **Dickson**. I assumed that it had been. The first item included is the alteration, repair, and maintenance of, except the liners or tubes, and replacing guns, the batteries not motorized that it was expected would be on hand June 30, 1918, plus one-half of those which it was expected would be on hand on June 30, 1919. As you will see, that was based upon 2,000,000 men maximum for two armies. The armament constituting the first item are —— 75-millimeter and 3-inch batteries; —— 75-millimeter and 3-inch ammunition batteries; —— 3.8 howitzer batteries; —— 4.7 howitzer batteries; —— 75-millimeter mountain batteries. The estimate was made by taking 20 per cent of the cost of the batteries, which makes $32,528,228.

Mr. **Borland**. You take 20 per cent of the cost?

Gen. **Dickson**. Yes, sir.

Mr. **Borland**. How much would that amount to?

Gen. **Dickson**. $32,528,228.

Mr. **Borland**. That is what you allow for alteration and maintenance?

Gen. **Dickson**. Yes, sir.

Mr. **Borland**. That is based on the number of guns you expect to have on hand on June 30, 1918, and one-half of the number of guns you expect to add to that number between that date and June 30, 1919?

Gen. **Dickson**. Yes, sir.

Mr. **Borland**. Will you have on hand on June 30 the number of guns that you are figuring on?

Gen. **Dickson**. Approximately so. If you will take the principal items here, you will see that the batteries are already in existence.

Mr. **Borland**. General, that item is based upon a peace footing. This alteration and maintenance of mobile artillery is based upon alteration and maintenance on a peace footing, but you are including in your A. of F. B item provisions for the repair and maintenance of such of the artillery as is actually in service in France.

Gen. **Dickson**. No, sir; we include in that the complete guns, carriages, etc., that will have to be provided to replace material that is captured or utterly destroyed.

Mr. **Borland**. Then you also provide in there for field repairs and ordinary maintenance back of the lines?

Gen. **Dickson**. That item was to provide the original motor truck repair shops.

Mr. **Borland**. Did it provide for their operation when once furnished?

Gen. **Dickson**. No, sir; that comes out of this appropriation.

Mr. **Borland**. Will that amount to 20 per cent of the original cost of the guns?

Gen. **Dickson**. That is based on the experience of the English and French.

Mr. **Borland**. What do you provide out of this $32,528,228—labor or material or what?

Gen. **Dickson**. We provide the spare parts, we provide the labor, we provide the material, and we provide the preserving materials.

Mr. Borland. This is supposed to include everything except the relining of the guns, and what else?

Gen. Dickson. Except new guns or new carriages to replace those that are lost. It does not include liners or tubes for insertion in old guns to rehabilitate those whose bores are worn out.

Mr. Borland. Does it include any expense for permanent machine shops which will be back of the lines in France?

Gen. Dickson. It includes the cost of all material, labor, etc., used in those shops.

Mr. Borland. Then a great deal of this money will be spent in the repair shops back of the lines?

Gen. Dickson. Yes, sir; and will be spent on motorized mobile artillery in the repair shops. Then the spare parts that are issued are provided out of this.

Mr. Borland. What does that word "alterations" mean? That originally, as I understand it, referred to the alteration of some of your guns under a general program that provided for their alteration; but that program has been carried out, has it not?

Gen. Dickson. Yes, sir; but from time to time it is necessary to embody a new feature or part in equipment like that, as, for instance, a different sight or range quadrant. That would have to come out of this. That is what we mean by alterations.

Mr. Borland. What other items have you under this?

Gen. Dickson. The next one is the alteration, repair, and maintenance, except gun tubes and liners, of ammunition batteries that are motorized, and includes all that it is expected will be on hand June 30, 1918, and one-half of those that will be completed during the fiscal year 1919.

Mr. Borland. Do I understand that the other items are not on a motorized basis?

Gen. Dickson. They are horsed, not motorized.

Mr. Borland. These are motorized?

Gen. Dickson. Yes, sir; this is motor equipment.

Mr. Borland. How much is that?

Gen. Dickson. The total of that is $46,896,600 for the motors, carriages, ammunition vehicles, etc. It is $120,267,000 for the repair of motor equipment.

Mr. Borland. Is this $120,267,000 for the repair of motor equipment?

Gen. Dickson. Yes, sir; for the repair of the motor equipment going with these batteries.

Mr. Borland. And that is confined to the machinery, tools, spare parts, and services of mechanics?

Gen. Dickson. Yes, sir.

Mr. Borland. That does not include the cost of the shops where the work is done?

Gen. Dickson. No, sir; it does not include the cost of the shops.

Mr. Borland. The first item you gave was $32,528,228, which I now understand applies to horse batteries. You are going to change those horse batteries into motor batteries and will provide for it under other estimates here, but you have provided for their repair and maintenance upon the basis that they were horse batteries. Now, does your item here cover those repairs in case they are motorized?

Gen. DICKSON. If you will recall, the item included 75-millimeter mountain guns, 4.7-inch howitzers, 3.8-inch howitzers, and 75-millimeter and 3-inch ammunition batteries which were not to be motorized and for motoring which we have not included anything in our estimate.

Mr. BORLAND. Then, your first estimate was for batteries that will remain horse drawn?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. And your item for motorized batteries included all batteries which you expect to motorize?

Gen. DICKSON. Yes, sir; not only the firing batteries themselves, but what we call the ammunition companies, too.

Mr. BORLAND. On what basis are those two estimates made? Are they made on the basis of 20 per cent of the original cost of the equipment?

Gen. DICKSON. The $46,896,600 is based on 20 per cent of the cost of the equipment, exclusive of the motor equipment. The $120,267,000 is based on 50 per cent of the cost of the motor equipment. Now, that item can be reduced from 50 per cent to 12½ per cent. Since that point was made the other day, I have made a corresponding change in the supplemental estimate, and this original estimate can be modified accordingly.

Mr. BORLAND. Will that have the effect of crippling you in any way?

Gen. DICKSON. I consulted with Col. Moody, who is an expert on that, and we thought that for the fiscal year 1919, knowing that you would be in session again and adjourn on March 4, we would be safe in reducing this from 50 per cent to 12½ per cent.

Mr. BORLAND. How much would that make it?

Gen. DICKSON. That will make that item $30,066,750.

Mr. BORLAND. What is the next item?

Gen. DICKSON. The next item is the alteration, repair, and maintenance of mobile antiaircraft artillery. Now, the repair, and maintenance, with the exception of replacing guns, tubes, or liners, for batteries, at 20 per cent of the estimated cost of the material, exclusive of the motor equipment, is $1,255,000, and 12½ per cent of the estimated cost of the motor equipment is $1,166,500. I am again reducing that from 50 per cent to 12½ per cent.

The next is the repair and maintenance of the motorized-truck companies for the batteries, which we cut to 12½ per cent, and that will be $126,500.

Mr. BYRNS. What was the estimate submitted?

Gen. DICKSON. $506,000. I am taking one-fourth of it.

Mr. BORLAND. What else is there?

Gen. DICKSON. Spare parts and maintenance of —— 8-inch guns and railway cars; —— service cars for 8-inch guns; —— 6-inch guns on wheel mounts; —— 5-inch guns on wheel mounts; —— transport vehicles therefor; —— limbers for —— 5-inch wheel mounts; —— 10-inch guns on railway mounts; —— service cars for the 10-inch guns; —— 12-inch guns and railway mounts; —— service cars for 12-inch guns; —— 12-inch mortars and railway mounts; —— service cars for 12-inch mortars. Based on 20 per cent, this amounts to $6,319,572.

Mr. GOOD. Is this supplemental?

Gen. DICKSON. No, sir; this is the original estimate. Now, all of that will be over there. The maintenance of motor equipment for —— 6-inch batteries and —— 5-inch batteries, based on 50 per cent. will be $1,567,600. I suggest, Mr. Chairman, that the committee allow that 50 per cent there, because that equipment will be over there.

Mr. GOOD. What do you mean by the expression "based on 50 per cent"?

Gen. DICKSON. The equipment will last only two years—that is, you have got to renew every part of that equipment in two years, or every one year you must renew one-half of it by repairing and maintaining it.

* * * * * * *

Mr. GOOD. You only pay for alterations out of this appropriation that are necessary after the gun has once been completed and is ready for service?

Gen. DICKSON. Yes, sir; after issue or ready for issue. If we put some into the storehouse all finished and accepted out of the other appropriation, which it is necessary to improve, then we have to turn to this appropriation.

Mr. GOOD. Where guns are lost in an engagement, destroyed or captured and are replaced, is that charged to maintenance?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Charged to maintenance?

Gen. DICKSON. Yes, sir.

Mr. GOOD. You propose, then, with these funds, to keep the number of guns you have detailed in good condition?

Gen. DICKSON. Yes, sir.

Mr. GOOD. And if a number of them are destroyed or lost others are purchased to replace them out of this appropriation?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Do we not carry in the original appropriation B an amount for replacement?

Gen. DICKSON. You do, Mr. Chairman. That is to establish the initial issue and reserve, because for every division for each class of gun you must have in France or wherever that division is, near it in a storehouse, a certain amount of equipment to start with, because in the very first engagement you may have a number of guns and carriages destroyed. That is what we call the initial reserve replacement. If they draw out a certain number in a month, out of this appropriation we must make a corresponding number and put back in store.

Mr. BORLAND. Then, this item does not seem to me at all large to cover and keep up the 50 per cent reserve.

Mr. GOOD. It is an expression of great confidence in our troops.

Mr. BORLAND. I thought that the 50 per cent was not intended to cover guns destroyed or captured in engagements.

Gen. DICKSON. Out of this appropriation.

Mr. BORLAND. Are you coming back here next December and say that we have decided that we want to replenish the reserve of guns which is one of the items under B?

Gen. DICKSON. No. A. of F. B is for supplying the initial equipment and the necessary reserve. If as time goes on you have to replace those you have taken out of reserve, it is done out of this appropriation.

The very next item is the item for replacing lost guns—that is, destroyed guns—and amounts to $59,065,500.

Mr. BYRNS. How do you arrive at that, by experience?

Gen. DICKSON. That is based on the number that will be in service with a factor which we have obtained, based on the experience of Great Britain and France.

The next item is maintenance of guns on wheel and railway mounts, which I read awhile ago, the total of which is $8,984,000. That is brought forward as a deduction under the supplemental estimate, but it was to be appropriated for under the original estimate. The next item is for maintenance, replacement, etc., of the trench mortars, which is $1,188,000.

Mr. BORLAND. The item of $59,000,000 is for field guns?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. The $8,000,000 is for guns on wheel mounts?

Gen. DICKSON. Five and 6 inch wheel mounts and 8, 10, and 12 inch railway mounts.

Mr. BORLAND. And $1,000,000 is for the trench mortars?

Gen. DICKSON. Yes, sir. Those three items amount to $69,237,500. In the act of October 6, 1917, under this appropriation there was a contract authorization of $50,000,000 and we should like that in cash.

Mr. BORLAND. What have you done with it?

Gen. DICKSON. Obligated it.

Mr. BORLAND. For what?

Gen. DICKSON. We will have to give you the details of that, sir.

Mr. BORLAND. Is that included in the $310,000,000 estimate?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. How much does that make the $310,000,000 since you have made these changes? You have nothing to show to what the $50,000,000 was applied?

Gen. DICKSON. We will give you that, sir.

Mr. BORLAND. You submitted an estimate in the deficiency act of March 12, 1918, of $18,513,000?

Gen. DICKSON. Yes, sir; $18,513,465. First, that is to provide spare guns, as follows: General Pershing requires two guns for each mount and one and one-half howitzers for each mount.

Mr. BORLAND. Does that embrace the whole $18,000,000?

Gen. DICKSON. Yes, sir. If you will remember in explaining the estimates under armament of fortifications "B" we had an item of —— 14-inch guns and railway mounts. This includes the spare 14-inch guns. Also we had an item for ——16-inch howitzers and railway mounts. This includes the spare 16-inch howitzers.

Mr. BORLAND. Let me understand that. Under armament of fortifications B where you have — 16-inch howitzers and mounts, you only estimate for —?

Gen. DICKSON. Service cars. We only estimate under B for the same number of howitzers as we did mounts. To get the spare or reserve howitzers we are asking for them under L.

Mr. BORLAND. That means that you are asking for how many 16-inch howitzers?

Gen. DICKSON. ———.

Mr. BORLAND. I do not understand why you put that under alterations and maintenance, instead of under the original item of armament of fortifications B. It seems to me that this alteration and maintenance item is intended to be confined to repairing and maintenance and should not be included in the guns furnished, either spare parts or replacements. I do not know whether that is the case. That is the way it would seem.

Gen. DICKSON. For the mobile artillery we have included in armament of fortifications B a certain number of surplus guns and carriages. When it comes to the seacoast guns or larger caliber caliber guns we have only put in the initial equipment, that is to say, the gun and mounts in A. of F. B, and then asked for the spares out of A. of F. L, under which we have also the estimate for liners, considering that to maintain your initial equipment you have to provide these spare guns as well as liners.

Mr. BORLAND. How does your $18,000,000 divide—how much for spare guns and how much for spare parts?

Gen. DICKSON. There are — 16-inch howitzers,, — 14-inch guns, and — 8-inch guns.

Mr. BORLAND. How much do they amount to?

Gen. DICKSON. $16,328,000. Spare parts for the 14-inch guns and their mounts, the service cars for the 14-inch guns, for the 16-inch howitzers and the railway mounts and the service cars for the howitzers, taken as 5 per cent of the cost is $2,185,465, which makes a total of $18,513,465.

Mr. BORLAND. Where are your liners?

Gen. DICKSON. They are in this supplemental estimate under A. of F. L.

Mr. BORLAND. The estimate we have not reached?

Gen. DICKSON. Exactly.

Mr. BORLAND. Why did you not estimate for those in your estimate of March 12?

Gen. DICKSON. Because it was not necessary to place the orders for the liners until this bill.

Mr. BORLAND. It is just as necessary to have them as the guns?

Gen. DICKSON. Yes, sir; but it takes longer to build the guns. We wanted to get started immediately on the guns. We can start in later, and get the liners in ample time.

NUMBER OF TROOPS TO GO ABROAD.

Mr. GOOD. General, the Evening Star of yesterday gives an interview with Mr. Caldwell, a member of the House Committee on Military Affairs, in which it is stated:

> Representative Caldwell stated that there are now 2,078,222 officers and men under arms. Of these more than 500,000 now are in France and 1,000,000 more

are amply trained to go. In a year, he said, there will be between four and five million men in France.

The statement of Representative Caldwell follows an interchange of letters with the Secretary of War, as the result of which Mr. Caldwell obtained from the War Department statements approved by the department, and his statement of yesterday is therefore considered of a semiofficial character.

If it is true that within a year we are to have 5,000,000 men in France, and the estimates you have detailed here are only for three armies of a million each, then obviously one of two things exists, either your estimates for guns and for ammunition are too small or the amount which you are asking for, based on three armies of 1,000,000 each, is altogether too large. Is not that true?

Gen. DICKSON. That would appear to be true; yes, sir.

Mr. GOOD. Are you coming in now with a further supplemental estimate for two more armies for service in France during the fiscal year that we ought to make appropriations for?

Gen. DICKSON. To the best of my knowledge the Chief of Ordnance has received orders to submit estimates for only three armies.

Mr. BYRNS. An army consists of more than a million men?

Gen. DICKSON. Yes, sir; an army with the troops at the rear, approximately 1,375,000, so three armies, including the combatants and noncombatants, would be a little over 4,000,000 men.

Mr. GOOD. You are not considering putting 4,000,000 men in France in the next year under these estimates?

Gen. DICKSON. I do not know at what time three armies will be in France, but these estimates do cover the artillery, etc., for three armies. The three armies will have a total strength of a little over 4,000,000 men.

Mr. BORLAND. Your instructions come from the Chief of Staff as to what the requirements are to be?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. And your estimates are submitted in accordance with those instructions?

Gen. DICKSON. Yes, sir.

We have refigured the original estimate with the changes which were proposed this morning, and the total is now $239,164,250.

Mr. BORLAND. That includes the $50,000,000 for the contract authorizations?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Did you find out what those contract authorizations were spent for?

Gen. DICKSON. No, sir. We will have to go into our books and make up a list. We will send that to your.

ALTERATION AND MAINTENANCE OF MOBILE ARTILLERY, ETC.

(See p. 296.)

Mr. BORLAND. Now, as to your supplemental estimates.

Gen. DICKSON. Under armanent of fortifications B you will recall that there was a certain number of mobile artillery batteries and ammunition companies included in the estimate. Under this appropriation, namely, armament for fortifications L, the same number of batteries have been enumerated, and an estimate made for repairs, alterations, and maintenance, excluding new guns, tubes, and liners, based on 15 per cent of the cost of the guns, carriages, and ammunition vehicles, but exclusive of the motor equipment, which makes $32,377,561.

Mr. **Borland**. These are the repairs of the ammunition batteries?

Gen. **Dickson**. And guns and carriages.

Mr. **Borland**. How does that differ from what we have been talking about this morning?

Gen. **Dickson**. Those that were given you this morning were for two armies. What I am reading to you now, and which is contained in this supplemental estimate, is for the maintenance and repair of additional equipment required to bring it up to three armies, and under the item "Armament of fortifications B" exactly the same number of batteries and ammunition companies were asked for as new material. I can read the number of batteries, etc., if you wish it. The motor equipment with this material, estimated at 25 per cent, is $59,138,420. The next item is the maintenance of the additional motor equipment required for batteries heretofore provided.

Mr. **Borland**. How much is that?

Gen. **Dickson**. Twenty-five per cent of the cost, which is $31,733,926. On the top of the last page which you have there the motorized mobile repair shops, the first item has been taken at 12½ per cent instead of 50 per cent, $30,550,000, which makes $3,819,400.

Mr. **Borland**. Is this for the repairs?

Gen. **Dickson**. This is for the maintenance and repairing of that equipment; yes, sir. The next item covers the second item in that same group at 12½ per cent and amounts to $2,296,000. Then the next item is 12½ per cent of the third item that you are looking at, which amounts to $8,226,300, and the next covers the 12½ per cent of the fourth item, which is $1,894,000.

Mr. **Borland**. Have we your repairs of the trench mortars?

Gen. **Dickson**. No, sir. The next item is to provide — spare 16-inch guns, $1,125,000. That is based on 20 per cent of the total guns. The next item is — spare 12-inch guns, $780,000; that is for similar replacements. Now, the maintenance of the railway mounts for different guns, taken on the basis of 10 per cent per year, is $3,300,000. The — 14-inch guns, with — railway mounts, the — 14-inch howitzers and their mounts, for their maintenance, repair, and alteration for one year, is estimated to be $4,370,930. Relining 14-inch guns at the rate of two liners per gun per year, $10,265,600; relining 16-inch howitzers at the rate of one liner per gun per year, $1,104,000; relining 8-inch guns at the rate of two liners per gun per year, $1,034,000. The next is the maintenance of the mobile artillery; that is, from the 75-millimeter to the 240-millimeter howitzer, for 3,000,000 men; that is, for three armies.

This estimate was prepared to cover the entire three armies and to then deduct from the total the part that was read this morning from the original estimate, for the guns in service for relining and retubing, of which it is expected, of all the calibers, there will be ———, the estimated cost is $65,457,000. That was based on the first 2,000,000 men for one year; it is now estimated that there will be ——— guns added for the three armies, but we are only estimating to take care of them for one-half of the year, and that amounts to $16,347,600. The next item is for relining, etc., the 5-inch, 6-inch, 10-inch, and

12-inch mortars, the cost of which is $29,752,400. To provide spare parts, etc., exclusive of relining, for the approximately ——— guns, the estimate is $22,638,800. For spare parts and other maintenance, exclusive of relining, for 5-inch, 6-inch, and larger calibers, $1,510,180. The sum of those five items is $135,705,980. When this estimate was made up there was available out of previous appropriations $21,800,000, and in the original estimate which we read this morning there was for these items a total of $68,049,500, so that the sum of these two amounts, namely, $89,849,500, should be subtracted from the total of $135,705,980, to obtain the amount required to be provided for in the supplemental estimate, namely, $45,856,480.

For replacements, maintenance, etc., of trench-warfare material, the replacements running from 50 per cent to 70 per cent per year—for instance, the 3-inch Stokes is 70 per cent—is $2,123,000. At the date this estimate was prepared $68,900 was available out of funds previously provided, and in the original estimate, which was read this morning, there is included $1,188,000, so that the sum of those two amounts, namely, $1,256,900, should be subtracted from the total of $2,123,000 to obtain the amount that is included in the supplemental estimate for trench-warfare material, which is $866,100. To the sums of these various amounts should be added 12½ per cent for inspection and the various administration expenses, etc.

Mr. Borland. How much have you altogether in this supplemental estimate? You have made some changes?

Gen. Dickson. Yes; the total will be $208,187,717.

Mr. Borland. Does that include your 12½ per cent?

Gen. Dickson. Twelve and one-half per cent will be $26,000,000.

Mr. Borland. Added to this?

Gen. Dickson. Yes; $26,023,465; making a total of $234,211,182.

Mr. Borland. That is instead of your supplemental estimate of $323,000,000?

Gen. Dickson. Yes, sir.

Mr. Borland. You are $89,000,000 below that?

Gen. Dickson. Yes, sir.

Mr. Borland. The total you gave first was $239,164,250?

Gen. Dickson. Yes. Please do not forget the deficiency estimate submitted March 12.

Mr. Borland. I have added that into the $239,000,000.

Gen. Dickson. We did not do that. I am bringing to your attention the item in the deficiency estimate of $18,513,465, which was explained this morning, and has therefore been excluded from these other amounts.

Mr. Borland. That gives me $491,888,897 as the total of these three estimates?

Gen. Dickson. Yes, sir.

Mr. Borland. How much of that should be cash?

Gen. Dickson. The original estimate and the supplemental estimate, sir.

Mr. Borland. Then the spare guns and the spare parts embraced in the deficiency estimate need not be cash?

Gen. Dickson. The original estimate and the deficiency estimate should be cash, and what is in the supplemental estimate can be contract authorization, with a general appropriation in cash under the four items of A. of F. B, C, L, and N of about $900,000,000.

Mr. BORLAND. General, how do you figure that? Your supplemental estimate is repairs, and do they not run along from month to month?

Gen. DICKSON. Yes, sir; but you will have another session, which will terminate March 4, and it was the idea that we could then ask you to appropriate cash during that session.

Mr. BORLAND. In other words, although you have divided the money on your own books into these various allotments, nevertheless, if we give you the money under the general clause, you can use it for any of these purposes, and you hope to have this margin left over until the next session of Congress?

Gen. DICKSON. Yes, sir. As soon as this money is appropriated, the orders will be given for all of the material, etc., that we have to manufacture. There is a good deal of this, as you see, which is labor, but we will not need all of the labor until later in the year, so we can ask you to appropriate cash in place of the contract authorization which will become effective next March. By your direction, we have been working out how much of these estimates should be in cash and how much could be in contract authorization, and we will have that for you later.

Mr. BORLAND. I figure out $491,000,000 as the total under A. of F. L. whereas your sheet submitted here shows $656,926,000. That $491,000,000 is intended to embrace all those items?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. So we have made a total reduction here of $165,000,000?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. I wish, then, that you would rearrange this sheet.

Gen. DICKSON. Yes, sir; we will do so.

TARGET-PRACTICE AMMUNITION, MOUNTAIN, FIELD, AND SIEGE CANNON

Mr. BORLAND. Your next item is: "For purchase, manufacture, and test of ammunition, subcaliber guns and other accessories for mountain, field, and siege artillery practice."

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Is that what you call armament of fortifications N?

Gen. DICKSON. Yes, sir.

Mr. BORLAND. Your estimate here, according to the committee print of the bill, is $93,000,000, but your original estimate, according to your sheet, is $51,500,000.

Gen. DICKSON. That is true. What we did was to rework this out entirely for the fiscal year 1919.

Mr. BORLAND. So that your amount is really $51,500,000?

Gen. DICKSON. Yes, sir; that is what we deducted, sir—$51,500,000—as having been included in the original bill.

Mr. BORLAND. In other words, your $93,000,000 estimate was revised, and you are starting now with a $51,500,000 estimate?

Gen. DICKSON. There have been a good many changes in the amount of ammunition that was prescribed. Our last instruction was to take double the amount prescribed in the target-practice order, and that is what I am working on. There is a War Department order prescribing the amount of target-practice allowance per year per battery, and the last instructions were to double it.

Mr. **Borland**. What was the date of that order? Is it a standing order?

Gen. **Dickson**. It is a standing order. I do not remember the date.

Mr. **Borland**. Put that in the record, please.

Gen. **Dickson**. Yes.

SPECIAL REGULATIONS NO. 32.

CHANGES No. 1. } WAR DEPARTMENT,
Washington, January 31, 1918.

Paragraphs 3, 5, 10, and 11, Special Regulations No. 32, Allowances of Ammunition for Mobile Artillery Instruction and Target Practice, are changed as follows:

3. Annual allowances of ammunition for mobile artillery instruction and target practice:[1]

Guns.	Rounds per battery.				
	Service ammunition.		Subcaliber ammunition.		Blank cartridges.
	Shrapnel.[2]	Shell.[3]	1.457-inch.	Caliber .30.	
2.95-inch mountain	**800**	**200**		**6,000**	**600**
3-inch gun	**800**	**200**		**6,000**	**600**
75-mm. antiaircraft	**1,000**				
75-mm. gun	**800**	**200**		**6,000**	
3.8-inch howitzer	**200**	**600**	**800**		**600**
4.7-inch antiaircraft	**800**				
4.7-inch howitzer	**200**	**600**	**800**		**600**
4.7-inch gun	**400**	**400**	**800**		**600**
6-inch howitzer	**200**	**800**	**800**		**600**
155-mm. howitzer	**200**	**800**			
155-mm. gun		**800**			
8-inch howitzer		**600**			
9.5-inch howitzer		**400**			

[1] **Regiments on duty as instruction regiments at School of Fire, Fort Sill, receive one-half of above allowance only.** (*S. R. No. 32, C. No. 1, Jan. 31, 1918, effective during the period of the existing emergency.*)

[2] **Batteries having 3-inch high-explosive shrapnel in their possession may expend not to exceed 100 rounds per battery in lieu of an equal number of common shrapnel.**

[3] 12½ or 18 pound cast-iron powder-charged shell for 2.95-inch mountain gun, high-explosive steel shell for other calibers.

5. *The School of Fire.*—The allowances of ammunition that may be expended for instruction purposes at the School of Fire will be fixed from time to time by the Chief of Staff. The proportion of shell and shrapnel is to be decided by the commandant. Allowances for this purpose are to be in addition to allowances prescribed for Field Artillery organizations stationed at Fort Sill. (*S. R. No. 32, No. 1, Jan. 31, 1918; effective during the period of the existing emergency.*)

10. *Target material.*—Data regarding the nature of this material will be found in Ordnance Pamphlet No. 1994, Mobile Artillery Targets and Accessories. On account of the limited facilities available at the average cantonment camp for target practice of mobile artillery units, and the semipermanence of some of the materials, only the following materials indicated by Ordnance Pamphlet No. 1994 will be issued on requisition except when specially authorized by the Secretary of War:

Olive-drab paint.
Black paint.
Brown paint.
Flesh-color paint.
Lampblack.
Cotton sheeting, 80 inches wide.
Cotton sheeting, 60 inches wide.
Sash cord.
Linen thread.

The amount to be requisitioned for will be one-half the allowance indicated by Ordnance Pamphlet No. 1994. Additional material will be supplied upon supplementary requisitions if found necessary.

Galvanized-iron fence wire, where indicated in Plate II of Ordnance Pamphlet No. 1994, and all material indicated on Plate III, will be procured locally, bills for the purchase of which will be sent to the department ordnance officer for payment. In addition, such minor items as fence staples, etc., as may be found necessary in the construction of targets are to be purchased locally, the allowance for which is to be one-half that indicated by Ordnance Pamphlet No. 1994.

Where facilities permit, and upon special requisition of the division commander, cable and cable carts will be supplied. The allowance will be that for one regiment.

On account of the complicated mechanism involved with flash and Infantry flash targets, these will not be supplied. (*S. R. No. 32, C. No. 1, Jan. 31, 1918; effective during the period of the existing emergency.*)

11. *Smoke-bomb outfits.*—The allowance of smoke-bomb devices for each battalion or battery separately stationed is 12 of the pole type. Fifteen hundred pounds of black powder and 12,000 musket primers are the annual allowances of expendable materials for a battalion, and one-half of this amount for a battery separately stationed. No more rifle grenade-type devices will be manufactured. The annual allowance of components for organizations having them on hand and desiring to use them is 1,600 rounds for a battalion and 800 for a battery separately stationed. This will be in lieu of one-third of the allowance for the pole type. Full data concerning these outfits will be found in Ordnance Pamphlet No. 1994. (*S. R. No. 32, C. No. 1, Jan. 31, 1918; effective during the period of the existing emergency.*)

[400.3401, A. G. O.]

By order of the Secretary of War:

JOHN BIDDLE,
Major General, Acting Chief of Staff.

Official:
H. P. McCain,
The Adjutant General.

Mr. Borland. On what number of guns being engaged in practice did you estimate this?

Gen. Dickson. We have estimated that ——— batteries would be using the 75-millimeter material; ——— using 4.7-millimeter; ——— using 155-millimeter howitzers; — using 155-millimeter guns; — using the 240-millimeter; — using the 3-inch antiaircraft; — using the 4.7-inch antiaircraft; — using the 4-inch Stokes mortar; — using the 6-inch Newton mortar, and — using the 240-millimeter trench mortar.

Mr. Borland. General, are you estimating for any target practice except for guns that are in the training camps?

Gen. Dickson. Yes, sir; there is a certain amount used abroad.

Mr. Good. General, why is it that in this estimate you include not only the ammunition for test but also subcaliber guns?

Gen. Dickson. This appropriation is intended to include ammunition, subcaliber guns, etc., required for training and instruction purposes for the mountain, the field, and the siege artillery.

Mr. Borland. General, how many guns do you estimate will be engaged in this training or target practice work during the fiscal year 1919?

Gen. Dickson. The number which I have just read.

Mr. Borland. That will be the normal or average list throughout the year, will it?

Gen. Dickson. Yes, sir; because in this country several brigades will have their target practice with the same guns.

Mr. Borland. Can you give the committee some idea of the number of guns you will have in service in the training camps of the

United States for any portion of this year and about what portion? We know you will not have the normal list of guns during the full year; but have you figured out with any accuracy about how many of these guns you will have in the training camps in the United States during the year?

Gen. DICKSON. I can get the number of guns that are now in the camps and add to it the estimated number that will be issued.

Mr. BORLAND. The guns now in the camps include a lot of 3.2s, a lot of old Russian guns, and all sorts of things of that sort. That is what they are using now.

Gen. DICKSON. I think we are using only the standard 3-inch and some 75-millimeter, which is also a standard piece. We are using 3.8-inch howitzers, the 4.7-inch gun, and the 6-inch howitzer.

Mr. GOOD. Will you be using nine times as many guns in the year ending June 30, 1919, as you used in the year ending June 30, 1918, for this practice?

Gen. DICKSON. I do not know that there will be nine times as many guns used for training, but there will be a good many times more companies or batteries of artillery to be trained with the guns we have.

Mr. GOOD. You do not supply the guns out of this? This is just for the ammunition?

Gen. DICKSON. Yes; this is for ammunition only.

Mr. GOOD. You are asking for about nine times as much money for this purpose as you used for the year 1918. You had a regular appropriation of $1,000,000, with a deficiency of $9,000,000, which would be $10,000,000, and you are asking for $93,000,000.

Gen. DICKSON. We had $10,000,000 in 1918, and then on March 28 we had to ask you for a deficiency of $33,100,000.

Mr. GOOD. But you did not get that?

Gen. DICKSON. Yes, sir; we got a contract authorization; so, you see, that makes about $43,100,000.

Mr. GOOD. You are asking now for about $127,000,000 for the next year?

Gen. DICKSON. For the ammunition for 1919 we are asking $86,990,738.

Mr. GOOD. That includes your supplemental estimate?

Gen. DICKSON. That includes both the original and the supplemental, but not this deficiency, because that applies to 1918 only. For 1919 we are asking you for a total of $86,990,738. We are asking, however, for that $33,100,000 in cash which was in the deficiency bill, and then we are adding 5 per cent for inspection, etc., making about $3,000,000 more.

Mr. GOOD. You will have, then, about twice as much as you had in 1918?

Gen. DICKSON. Yes; almost exactly.

Mr. BORLAND. General, you figure on a certain number of rounds per gun, do you; or do you figure on a certain number of rounds per company of men?

Gen. DICKSON. There are a certain number of rounds allowed per company of Artillery.

Mr. BORLAND. Your original estimate was $51,500,000, and you got a contract authorization in the deficiency bill?

Gen. DICKSON. Yes, sir; $33,100,000.

Mr. **Borland.** Have you obligated that?

Gen. **Dickson.** I think every penny of that is gone. As a matter of fact, we placed orders almost immediately, or even before we got that in. We had to.

Mr. **Borland.** You do not make any distinction in the placing of orders between practice ammunition and the other ammunition?

Gen. **Dickson.** No, sir; as a rule, almost every bit of it is exactly the same.

Mr. **Borland.** There may be some little subcaliber ammunition?

Gen. **Dickson.** Yes, sir; there is some caliber .30, and, of course, blank cartridges and dummy cartridges and things like that, but the regular service ammunition is identical.

Mr. **Borland.** Do you use for practice purposes the slugs instead of shells such as they use at the proving grounds?

Gen. **Dickson.** No, sir; the artillery claim that they do not get proper instruction if they use slugs. For instance, they want a certain percentage of shrapnel, because one of the most important parts of the training is to teach the personnel to catch instantly the burst of a shrapnel in the air. They use that for ranging and to determine whether the burst is too high or too low. They also require the high explosive shell, so that they can train their men to see what results they get with it.

Mr. **Borland.** So that your ammunition is pretty nearly of the same quality in almost every case as your service ammunition?

Gen. **Dickson.** Yes, sir; we have, for instance, 1-pounder ammunition, which, of course, does not have to be standard. That can be a slug. Then we also have some caliber .30 ball cartridges, used in the 75-millimeter and light pieces for training gunners, etc.

Mr. **Borland.** General, what is the explanation of your $72,000,000 supplemental estimate?

Gen. **Dickson.** I just read the number of batteries or companies of artillery to be given instruction with what we call our mobile artillery and with the trench-warfare material. I have a table in which the allowance per company of shell and shrapnel, etc., is entered for each of these batteries, the total amount of ammunition, and then the unit cost, and then the total, which amounts to $32,398,240 for service ammunition for all guns and trench mortars up to 240 millimeters. Then we have another item for 10-inch guns and 12-inch mortars, which amounts to $952,000. For subcaliber ammunition provided for the mobile artillery for the number of batteries previously read the allowance varies from 800 to 6,000 pounds per battery, and the total for that is $785,520. There is about 600 rounds per battery of blank ammunition, and the cost of that is $132,582. Then target-practice material, targets, etc., $1,125,000. Then there is an item of 75-millimeter ammunition and some subcaliber ammunition for infantry headquarters company, divisional training school, and training battalions, which is carried on in connection with the use of subcaliber in the guns, also with shell and shrapnel, and also with the trench-mortar ammunition, which amounts to $25,959,060. A great deal of that is shipped abroad and used in the training camps and the balance of it is used in this country. A good deal of that is for training officers. That material has been prescribed by the General Staff.

Mr. Borland. Is that what you use at the school of fire at Fort Sill?

Gen. Dickson. No, sir. We have an entirely separate item for that. The General Staff told us to provide for Fort Sill for shell for 3-inch guns, 727 rounds; 75-millimeter guns, 1,818 rounds; 3.8-inch howitzers, 1,454 rounds; 4.7-inch guns, 1,454; 6-inch howitzers, 1,818 rounds; 155-millimeter guns, 1,091 rounds; 155-millimeter howitzers, 1,091 rounds. Now, that is all shell. Shrapnel for the 3-inch guns, 5,816 rounds; 75-millimeter guns, 1,818 rounds; 3.8-inch howitzers, 1,818 rounds; 4.7-inch guns, 1,091 rounds. Now, we credit back the cartridge cases to the guns using them. That total amounts to $24.760,268.

Mr. Borland. What total?

Gen. Dickson. The total for Fort Sill.

Mr. Borlan. Is that in this item?

Gen. Dickson. No, sir; that is separate.

Mr. Borland. Where do we find it in the estimates?

Gen. Dickson. I can give it to you. I have a table.

Mr. Borland. But where is it in the estimate?

Gen. Dickson. That goes to make up this $86.000,000; sir. The previous items I read totaled $61.352.402. Then we are told to submit for training officers at Fort Monroe, for instance, for the 3-inch gun, 1,200 rounds; 3-inch antiaircraft, 2,400 rounds; 240-millimeter trench mortar, 1,600 rounds; 6-inch sea coast, 800 rounds; 8-inch sea coast, 120 rounds; 8-inch howitzer, 400 rounds; 9½-inch howitzer, 400 rounds; 10-inch gun 120 rounds; 12-inch sea-coast mortar 120 rounds. The total cost of that is $400,588.

Gen. Dickson. Now, the last item is the subcaliber and drill equipment. Subcaliber kits have to be provided for — batteries of 75-millimeter and 3-inch guns. Also, subcaliber tubes are to be provided for — batteries of 4.7-inch and larger calibers; — drill projectiles are to be provided for — batteries, and — drill projectiles for 155-millimeter batteries. The cost of which is $177,480. The sum of those four items is $86,990,738. Now, that would be a total cost for the year 1919, if we add to that the 5 per cent——

Mr. Borland (interposing). Where have you added the contract authorizations?

Gen. Dickson. They have not added that in. That is the total cost for 1919. What we did was to subtract that from what we thought was in your book, namely, $51.500,000, or the amount included in the original estimates.

Mr. Borland. You subtracted $51,500,000 from the $86,000,000?

Gen. Dickson. Yes, sir; leaving $35,490,738. Then we added to that $33,100.000 of contract authorizations, and then added 5 per cent for inspection, contingencies, etc. That was $3,429,537, and it made $72,020,275. So that, what we are really asking you for in this item for the year 1919 is $86,990,738, plus 5 per cent, or $3,429,537, and then we are asking cash for the contract authorization contained in the deficiency act of March 28, 1918, of $33,100,000, which $33,100,000 is to get us through the present fiscal year.

Mr. Borland. Your total is about $125,000,000?

Gen. Dickson. Yes, sir; but please bear in mind that the $33,000,000 is a deficiency in the present fiscal year.

Mr. Borland. You want $51,000,000 and $33,000,000 in cash?

Gen. **Dickson**. Yes, sir.

Mr. **Byrns**. And the balance in contract authorizations?

Gen. **Dickson**. Yes, sir.

Mr. **Borland**. Do you have a school of fire for officers at Fort Monroe?

Gen. **Dickson**. Yes, sir. The Coast Artillery Corps is training not only Regular officers, but a good many officers in the Artillery Officers Reserve Corps to man the heavy guns and some of the trench mortars.

Mr. **Byrns**. Going back to the cash you wanted, $31,100,000, plus $51,500,000 does not make $86,000,000.

Gen. **Dickson**. The act of March 28, 1918, carried $33,100,000, and the original estimate in here was $51,500,000, and that makes $84,600,000.

Mr. **Byrns**. As cash?

Gen. **Dickson**. Yes, sir. I made a mistake in my addition.

GENERAL CONTRACT AUTHORIZATION.

(See p. 315.)

Mr. **Borland**. General, we are down now to the question of this general contract authorization. I find in the new estimates submitted by the Secretary of War that he wants $1,000,000,000 in the form of a very broad contract authorization. My understanding is that one-half of that is included for the Ordnance Department, or $500,000,000 of it.

Gen. **Dickson**. Yes, sir; the full billion dollars was for the Ordnance Department. The understanding was that the committee on military affairs would authorize a general contract authorization of $500,000,000 in addition to the amount specifically covered in the different appropriations which it makes for the Ordnance Department, and it was hoped that your committee would also include a general contract authorization of $500,000,000 for the items included in this bill.

Mr. **Borland**. This general contract authorization is entirely supplemental to and independent of this whole program which you have given us?

Gen. **Dickson**. Yes, sir.

Mr. **Borland**. Have you any way of enlightening the committee as to what will be done with the additional contract authorization?

Gen. **Dickson**. The Chief of Ordnance, at the time these estimates were prepared, had no specific uses in mind for that authorization, but during the past five or six months so many new items have been called for, and as the size of the authorized Army has been increased, and as so many additional facilities to meet the schedule have to be provided, it was considered wise and proper to ask for a general contract authorization of that amount so that the officers of the department, in order to meet the needs, might not have to disobey the law by incurring deficits. For instance, you take this big gun program: That came right out of the clear sky, and there will probably be other projects. If we have the general authorization, then we have the authority of Congress to proceed.

Mr. GOOD. You would not need a billion dollars to cover such emergencies as might arise during the recess of Congress, would you?

Gen. DICKSON. That is very hard to say definitely, but please bear in mind this, that, for instance, in March the department submitted a deficiency estimate to cover materials and plants, the need for which unexpectedly developed, and we have not got the money yet. Please do not think that that is a complaint, but in order to go ahead and meet these schedules, we had to incur deficits. If we have the contract authorization, then we have the authority to do that, and it is legal. But when we incur a deficit, we know what we are doing. We are also doing another thing: We may be getting material for which we can not pay, and private manufacturers find it exceedingly difficult, and very often impossible to borrow money now, and the department is trying to be very fair and just to everybody that deals with it.

Mr. BYRNS. General, your failure to get your appropriation under the deficiency estimate submitted in March, for instance, really did not delay the department in making contracts and procuring those supplies?

Gen. DICKSON. Not a bit; because the officers in the department assumed the responsibility and took chances on being court-martialed for incurring deficits.

Mr. BYRNS. Of course, since those supplies were needed for carrying on the war, there was not much risk assumed. Do you think there would really be any danger if there were no such authorization made as you have requested, or do you think that any harm or injury would result from the failure to provide that between now and December? In other words, if the need did arise between now and December for additional contracts, could not the department go ahead and make those contracts under the same circumstances that it made the others?

Gen. DICKSON. It can if it is willing to violate the law, because there is a law that prohibits the incurring of deficits, and we do not like to do that.

Mr. BYRNS. Of course, I can appreciate that.

Gen. DICKSON. That has been my training.

Mr. BORLAND. While we appreciate the fact that you want to stay within the law, we also appreciate the fact that the contractor might have to borrow money to carry out his contract, and the point might be made that you must have authority of law to make the contract.

Gen. DICKSON. That is exactly the point. When I give a man an order and I have neither the money nor a contract authorization. I question whether the contract which he executes with the Chief of Ordnance is a legal one.

Mr. BORLAND. Here is the question, General: You have already estimated here for very large contract authorizations for everything that you could possibly foresee, and this is a very large additional margin for contract authorization; that is, $500,000,000 in this bill and $500,000,000 in the Army bill. It may be that there would be some demand upon that, but between now and next December it does not seem that there would be that much demand.

Gen. Dickson. Mr. Chairman, in the original estimates and in the supplemental estimates we can show you the exact items and numbers thereof that are required to meet the present schedule, and the total sum which we are asking in the original estimates, the deficiency estimates, and the supplemental estimates is for buying specific items, and the only leeway that we have got is the 12½ per cent or 5 per cent which you are giving us, and the major part of that is necessary for inspection, production, purchasing, engineering, and testing expenses.

Mr. Borland. You have 25 per cent figured in these other items, I believe?

REDUCTION IN ESTIMATES.

(See p. 316.)

Gen. Dickson. At your suggestion, we are reducing them to 12½ per cent.

Mr. Borland. I have not heard of that reduction.

Gen. Dickson. I am reducing them.

Mr. Borland. Well, let us see where it is. You are reducing that to 12½ per cent?

Gen. Dickson. Yes, sir. I understand that that is your wish, and I am trying to comply with it. Now, under A. of F. M. we are adding only 5 per cent.

Mr. Borland. I notice that you do under that item.

Gen. Dickson. Under A. of F. L. we add 12½ per cent.

Mr. Borland. You had a total of $540,000,000.

Gen. Dickson. Yes, sir: but I have cut that down. I have a new statement here.

Mr. Borland. How much did you cut it?

Gen. Dickson. Under A. of F. C. that item of 25 per cent was reduced to 12½ per cent. It now amounts to $185,800,000.

Mr. Borland. What difference does that makes in the item of $540,000,000? With all of it lumped together, you have $540,000,000, and I want to know how much that has been reduced?

Gen. Dickson. That item now, when reduced to 12½ per cent, is $185,800,000.

Mr. Borland. It is $185,800,000 instead of $540,000,000?

Gen. Dickson. Yes, sir.

Mr. Borland. That is a reduction of more than 50 per cent?

Gen. Dickson. Yes, sir. I understood that you wanted the cost of the plants taken out and I did so. $185,800,000 is what it amounts to now.

Mr. Borland. There is one place where I am confident you can protect yourself by a deficiency, and that is in connection with your building program, because if you run into any deficiency there you can get it in December. You will not be very far along with that in December.

Gen. Dickson. I think your point there is well taken. Under A. of F. B, the estimate of $212,626,224, when revised in accordance with your suggestion, becomes $87,200,000.

Mr. Borland. That is the gun program?

Gen. Dickson. Yes, sir.

Mr. Borland. On what was that $212,626,224 figured? Was it figured on every item in the bill?

Gen. **Dickson**. Yes, sir.

Mr. **Borland**. You did not figure that on the reserves for Gen. Pershing or the raw materials for Gen. Pershing?

Gen. **Dickson**. Yes, sir; but I have cut that out now. I took that out.

GENERAL CONTRACT AUTHORIZATION.

(See p. 312.)

Mr. **Borland**. That brings us back to the $500,000,000 contract authorization. You have not in mind, I assume, any specific use that you have for that, because if you had it in mind, you would have included it in some of these supplemental estimates.

Gen. **Dickson**. As I said awhile ago, when these estimates were prepared, we had no specific items in mind, but during the past few months we have been called on for very large quantities of expensive material that required the construction of new plants, and we do not know but what we are going to have another call in a few days.

Mr. **Borland**. Have you anything else you would like to offer?

GUNS FROM THE NAVY.

(See pp. 215, 320, 429.)

Gen. **Dickson**. Yes, sir. Carrying out your suggestion, I have redrafted the various heads of the sum total of A. of F. B., using 12½ per cent instead of 25 per cent for inspection, production, procurement, engineering, etc., and instead of the item of $3,297,000 for guns purchased from the Navy, including 30 to be purchased from Bannerman, I have put in there only $450,000.

Mr. **Borland**. I am not prepared to authorize that. I do not know what the bookkeeping methods are between you and the Navy, and it is just a question of bookkeeping after all as to whether we appropriate for it in this bill and let the Navy take credit for everything bought from the Navy, or let the Navy take credit for it on their own books. We will thrash that out with the Naval Affairs Committee.

Gen. **Dickson**. We have reduced the total. Whether you appropriate this and transfer it on the books of the Treasury, or whether you appropriate it directly to the Navy, is a matter for you to determine. The practice has been to transfer the funds.

Mr. **Borland**. There is another thing that occurs to me: If the Navy wants to receive an appropriation for these guns and you receive an appropriation for the same guns, there will be two appropriations out of the Treasury for the same guns. Now, while it is true that the guns have been transferred from one department to the other, it seems to me that one appropriation out of the Treasury by Congress ought to answer, and the rest of it ought to be a matter of bookkeepings between the departments. It does not seem to me that there ought to be a duplicate appropriation out of the Treasury for the same material.

Gen. **Dickson**. It is my understanding that the Navy desires that money to buy other guns in place of them.

Mr. **Good**. Of the same caliber?

Gen. **Dickson.** I can not answer that question, but I would think so. So that would make a total for A. of F. B. of $885,065,295.

Mr. **Borland.** That leaves out the Navy appropriation?

Gen. **Dickson.** Yes, sir; that leaves it out.

Mr. **Borland.** All except $450,000.

Gen. **Dickson.** Yes, sir; except $450,000. It includes only $450,000 out of the $3,297,000.

Mr. **Good.** Have we sold any guns in the Army to any of these secondhand dealers in war materials during the last five or six years?

Gen. **Dickson.** I do not recall a single gun that has been sold, unless it was some old smoothbore ante bellum cast-iron guns which the cities did not wish for ornamental purposes.

REDUCTION IN ESTIMATES—GENERAL STATEMENT.

(See p. 314.)

The estimates under the appropriation armament of fortifications C were reworked along the same line, the change coming in after the subtotal for purely manufacturing materials of $1,486,547,550. Twelve and one-half per cent has been added to that for the administration expense which makes $185,800,000, instead of $540,278,887. Then the item for powder and explosive plants, etc., $190,982,000 was added, and the item of $2,000,000 for temporary proving grounds, making a total of $1,865,329,550.

Mr. **Borland.** Instead of $2,701,000,000?

Gen. **Dickson.** Yes, sir. Besides that we have to get cash which we are going to arrange under the contract authorization of March 12, of $80,725,000.

Mr. **Borland.** What about the allotments to Gen. Pershing under C?

Gen. **Dickson.** I have cut them out.

Mr. **Borland.** There was some question raised whether they should not be credits on your ammunition program?

Gen. **Dickson.** What I did was to eliminate them.

Mr. **Borland.** Were you satisfied to eliminate them?

Gen. **Dickson.** Yes, sir.

Mr. **Borland.** You think if he has ordered a supply of ammunition over there, that amounts to a credit?

Gen. **Dickson.** For ammunition.

Mr. **Borland.** Which relieves you from that much?

Gen. **Dickson.** Which we do not have to supply, but as to the guns and carriages under A of F. B, that is different.

In regard to the 12-inch guns which are to be included in a new supplemental estimate, the cost of the guns and carriages to be purchased and of the three railway mounts and one service car to be manufactured, will be $2,005,000, and the cost of the ammunition is $180,000. The $2,005,000 will, therefore, be included under A. of F. B, and the $180,000 under A. of F. C.

Very careful computations show that the estimated requirements of smokeless powder to be manufactured in this country during 1918 are as follows: Ordnance Department of the Army, ——— pounds; United States Navy, ——— pounds; France, ——— pounds; England, ——— pounds; and Italy, ——— pounds.

Mr. **Borland.** The requirements on this country of the respective countries?

Gen. **Dickson.** Yes, sir. It all has to be made in this country. That totals ——— pounds. Including the quantity that will be obtained from all enlargements that have been made in existing powder plants, from the Nashville plant, the Charleston plant, and from that plant with a 300,000-pound capacity a day, of which we have $45,000,000 included in the estimate that could be obtained from those facilities during this year, in addition to the existing facilities the total quantity that can be obtained is ———, leaving a deficit of practically one-third of the total required. In 1919 our estimated requirements will be ———, whereas the estimated production will be ———, or ——— pounds surplus.

Powder plants are put up in what they call units, and each unit is capable of producing 100,000 pounds per day. This estimated surplus is therefore just a little more than one unit would produce in a year and less than two units would produce. The material that you are making is very inflammable and it is considered that that is a very small margin, and it is considered that these careful estimates fully demonstrate the necessity for the erection of all the new facilities for producing gunpowder, including the 300,000 pounds per day plant, which has not yet been started.

Let us turn to high explosives used as bursting charges in projectiles, hand grenades, drop bombs, and so forth. The estimated requirements during 1918 are as follows: Ordnance Department, ——— pounds; United States Navy, ——— pounds; France, ——— pounds, and Italy, ——— pounds; making a total of ——— pounds. The estimated producing capacity, including the output that can be obtained during this calendar year from facilities already authorized, is only ——— pounds, leaving a deficit of ——— pounds, about one-third of the total requirements. The total estimated requirements in the calendar year 1919 are ——— and the total producing capacity is ———, or an apparent surplus of ——— pounds, but one of the plants detonated last week had a capacity of ——— pounds a month, which is about one-half of the apparent surplus. So it is considered that the surplus here is too small, and it is further considered that these figures fully justify the additional facilities.

Mr. **Borland.** Are you taking into consideration this new method of using ammonium nitrate in place of T. N. T. and the other explosives?

Gen. **Dickson.** Yes, sir. That does not change the total number of pounds required, but it changes the number of pounds of each explosive required, and, thank goodness, it reduces the cost. Please note in the case of powder that for the two years we face a deficit of ——— pounds, and in the case of the explosives we face a deficit for the two years of ——— pounds. If the Army is further increased additional facilities for the production of powder and explosives will have to be provided, as is evident from these figures.

MONDAY, MAY 27, 1918.

PROCUREMENT OF ORDNANCE MATÉRIEL.

(See pp. 323, 348.)

STATEMENT OF COL. SAMUEL McROBERTS, NATIONAL ARMY, CHIEF OF PROCUREMENT DIVISION, ORDNANCE DEPARTMENT; COL. E. S. HUGHES, MAJ. MERRILL G. BAKER, AND MAJ. A. W. FAIRCHILD.

Mr. BORLAND. Colonel, we will take up at this time armament of fortifications C, which is the appropriation for the purchase, manufacture, and test of ammunition for mountain, field, and siege cannon. In the fortifications appropriation bill of 1918 you had for this purpose $7,310,000, and under the deficiency acts of June 15, 1917, and October 6, 1917, a total of $1,030,000,000. Within the same time you had a contract authorization for $779,182,750. You also had in the deficiency act of March 28, 1918, a contract authorization of $80,725,000. I wish you would please advise the committee of the purposes to which these appropriations have been put.

Col. McROBERTS. It is almost impossible for me to answer, for the simple reason that the records of the Procurement Division are kept on the line of material without regard to the appropriation to which the particular material is charged. I have had memorandums prepared in an effort to identify these appropriations, which we may be able to do; but as far as the records of the Procurement Division of the Ordnance Department are concerned, they are not kept with a view of showing the disposition of appropriations.

Mr. BORLAND. Is it not true that you have a program for the Field Artillery equipment and ammunition requirements of the Army being raised for use in this war, and that you are working toward the carrying out of that particular program, which involves a certain amount of ammunition for a certain number of pieces?

Col. McROBERTS. Yes, sir.

Mr. BORLAND. And is it not true also that you must carry that program out with the appropriations furnished from time to time by Congress, based upon the estimates made by your department?

Col. McROBERTS. Yes; but the application of the money is made in the Finance Division of the Ordnance Department, and not in the Procurement Division. We get orders to acquire the material decided on for the requirements of the Army and a statement of the amount of money set aside for that purpose. We pay no attention to what appropriation it comes under, but simply proceed to fill the requirements by contracts and purchases.

Mr. BORLAND. Are you not guided by the appropriations which have been made and contract authorizations which appear in the appropriation bills?

Col. McROBERTS. No; we are not, because with each requirement is a certificate that money has been set aside for that purpose on the books of the Ordnance Department.

Mr. BORLAND. And that is done by the Finance Division?

Col. McROBERTS. Yes, sir.

Mr. BORLAND. Will your records show the amount of money which has been set aside for the purchase, manufacture, and test of ammunition for mountain, field, and siege cannon since the date of the last fortifications bill, February 14, 1918?

Col. MCROBERTS. Our records will show the amount of money set aside for these contracts, but our books do not identify those various amounts with specific appropriations.

Mr. BORLAND. As I understand, information comes to you from the Finance Division that a certain amount of money has been allotted for that purpose?

Col. MCROBERTS. Yes, sir.

Mr. BORLAND. And within that limit you make your contracts for that material?

Col. MCROBERTS. Yes, sir.

Mr. BORLAND. How much has been set aside for this ammunition?

Col. MCROBERTS. I can tell you the total of our contracts for ammunition, but whether it is all included in these appropriations or not I can not say. I can not identify it along the lines of the appropriation, because it may be partially chargeable to Army appropriations. We have an order, for instance, to buy so much in quantity of field artillery of a certain type and limited to a certain amount of money for that purpose. We contract for that material, notifying the Finance Division of what the cost, or estimated cost, of it will be, and they release whatever surplus there may be for other purposes. That is the method under which we operate.

Mr. BORLAND. What is the memorandum you have there in relation to item C?

Col. MCROBERTS. Well, I have a list purporting to show the amount of material purchased under armament of fortifications C, act of June 15, 1917. This would show that under that act there was appropriated $367,000.000 and that there was $5,274,434.43 on hand from the previous appropriation; that is, of April 30, 1918.

Mr. BORLAND. That is exactly what we want. That is as to that appropriation, but you have two other appropriations besides that—the fortifications act and the deficiency act of October 6—and then you had a contract authorization on March 28.

Col. MCROBERTS. I have no record of that here.

Mr. BORLAND. You only have one, and that is as to the act of June 15.

Col. MCROBERTS. Yes. That is the only memorandum on that subject I have. I have the seacoast cannon, armament of fortifications D, F, G.

Mr. BORLAND. Instead of attempting to give us the records of the Finance Division, why would it not be better to start with the beginning of the records in your division, to wit, the allotments of money that have been made to you for these purposes, giving the committee information as to how much money has been allotted to you for the purchase of ammunition and the contracts you have made under those allotments, the amount that has been used in that way, and the amount that is still unallotted.

Col. MCROBERTS. Well, I might work it out, but still we are confronted with the difficulty that we are not concerned with a financial statement; we are only concerned as to orders for material.

Mr. **Borland.** But you must have some financial basis. You can not exceed the amount of money that has been allotted to you by the Finance Division?

Col. **McRoberts.** No; but we can not get up a statement along that line. For instance, I have such a statement as this: Armament of fortifications C, balance on hand—this is taken from our own books—October 6, 1917, cash so much, and contract allotments so much.

Mr. **Borland.** So far as the amounts appropriated, the amounts allotted, and the unexpended balance are concerned, I have no doubt this statement is exactly in the shape we are accustomed to have it, but it does not cover the appropriations you have had since the last appropriation bill, and it is necessary for us to have it in that form.

Col. **McRoberts.** Is not the last appropriation bill shown there?

Mr. **Borland.** No; the last fortification bill was approved on February 14, 1917. Of course very little of that money was expended before the actual declaration of war, so that practically all of it was for the operations of this war. Then that was followed by the act of June 15, 1917, the act of October 6, 1917, and then by this authorization of March 28, 1918. It is impossible for us to examine you with any satisfaction on the present condition of your appropriation or the present condition of the contracts unless this statement is brought down to include that information.

Col. **McRoberts.** I realize that. If I can get clearly from the committee what you want in the way of a financial statement, I will undertake to furnish it.

Mr. **Borland.** When did you become associated with the department?

Col. **McRoberts.** On November 26, 1917.

Mr. **Borland.** So that this practically represents your work?

Col. **McRoberts.** Yes, sir; from October on. From that time on I can make a clear statement.

Mr. **Borland.** Prior to that time who did the work that you now do?

Col. **McRoberts.** The department was organized along the line of material rather than the line of functions. Each division had its own purchasing division, and it is a consolidation of all of them that I now have charge of. The purchasing sections of the old divisions were consolidated into the present Procurement Division. Prior to that time each one had its own purchasing section.

Mr. **Borland.** Col. Tripp, when on the stand this morning, stated that you could tell us about this.

Col. **McRoberts.** I think I can give you in a general way the information you want, apart from a financial statement. As to a financial statement, it will require a great deal of work and time to get it in proper shape.

PURCHASE OF GUNS FROM MR. BANNERMAN.

(See pp. 215, 315, 429.)

Mr. **Borland.** Colonel, the statement was made here in some of the evidence that we had purchased certain guns from the Navy, or certain naval guns. It was stated that we had purchased thirty 6-inch naval guns from a man named Bannerman, who is a dealer in naval stores in New York, and the statement was made that you were familiar with the terms of the purchase. What is the history of that Bannerman transaction?

Col. McRoberts. The only one that I am familiar with, and there has been only one recent purchase, is one that is in process now.

Mr. Borland. Is that the transaction covering thirty 6-inch naval guns?

Col. McRoberts. That transaction is not yet completed. The last act in that was to inquire from the Navy exactly what they got for those guns, and we have not yet had an answer from them. We will not proceed with the negotiations until we get that information. We want to know what Bannerman paid the Navy for the guns.

Mr. Borland. Has there been any contract made by you with Bannerman?

Col. McRoberts. Not yet.

Mr. Borland. Has he named any price?

Col. McRoberts. I think he has named a price, but that will not interest me until I find out what he paid for them.

Mr. Borland. Now, what practical bearing will that have on the transaction?

Col. McRoberts. I think it will have very much bearing on it. In other words, there is no market price here for cannon. we do not propose to allow somebody to obtain a large price just because we have to buy the cannon. We are trying to get at the basis of the cost, and in that case we would feel that he will be entitled to a reasonable profit for handling them.

Mr. Borland. Did you have any report on the condition of the guns?

Col. McRoberts. Yes; a report from the Engineering Division.

Mr. Borland. You would not negotiate for them without inspection, would you?

Col. McRoberts. We have been given a preliminary statement that they would be usable guns.

Mr. Borland. Have you any information as to how Mr. Bannerman acquired them from the Navy?

Col. McRoberts. No, sir; I do not know. I understand that they acquired them from the Navy, but I do not known about that.

Mr. Byrns. How long has he had the guns?

Col. McRoberts. For some time—six or seven years. They were abandoned guns on the part of the Navy.

Mr. Borland. What do you mean by abandoned guns?

Col. McRoberts. They were guns that were obsolete for some reason or other, I suppose. I assume that to be the case. I have practically no knowledge of the thing. The way these things operate is this: Guns that were considered no longer usable would be cast aside, and Bannerman would probably buy them with the idea of selling them to some South American Republic. He is a broker in that sort of material. He is also a broker in all sorts of material, such as small arms. If we could not get them at what we thought seemed to be a fair price, we could commandeer them.

Mr. Borland. If we are ever to need them at all, we need them right now.

Col. McRoberts. Yes, sir.

Mr. Borland. You say that you have not had information from the Navy as to what Bannerman paid for the guns?

Col. McRoberts. No, sir.

Mr. Borland. It is your intention not to pay any more than a just profit for handling them over and above what he paid the Navy Department for them?

Col. McRoberts. That is true.

Mr. Borland. Do you conduct the negotiations with the Navy Department for the guns you acquire from them?

Col. McRoberts. Not in all cases; no, sir. Sometimes it is done by the War Department. I do not think that in any case has the Procurement Division conducted those negotiations with the Navy Department. As a rule those negotiations are conducted by the Chief of Ordnance or by somebody in the War Department. Generally some arrangement is made, either through the Secretary of War or the Secretary of the Navy, and it eventually works down to our department. I do not recall any important negotiations that the Procurement Division has participated in in connection with acquiring guns from the Navy.

Mr. Borland. In addition to these Bannerman guns you are on the point of buying $2,995,000 worth of guns from France?

Col. McRoberts. We have never discussed that with them. I have not negotiated with them at all.

Mr. Borland. You have not negotiated with them upon the price to be paid?

Col. McRoberts. No, sir.

Mr. Borland. Who does that?

Col. McRoberts. That is done through the War Department or the Chief of Ordnance through Gen. Pershing's staff in France.

Mr. Borland. You do not have anything to do with orders that are placed in France for Gen. Pershing?

Col. McRoberts. No, sir.

Mr. Borland. You have no relation with it?

Col. McRoberts. The orders are initiated on the other side, and they simply ask appropriations for certain material that is purchased over there.

Mr. Borland. Some of the negotiations in France provide for our furnishing certain raw materials as a part of the purchase price?

Col. McRoberts. Yes, sir.

Mr. Borland. Does the supplying of that raw material go through your department?

Col. McRoberts. Yes, sir.

Mr. Borland. Are you able to inform the committee how much raw material you have been called upon during the present fiscal year to furnish, and how much you have supplied them with?

Col. McRoberts. It would be quite impossible without making a record especially of it. We have the records from which such a statement could be made.

Mr. Borland. You have Gen. Pershing's requisitions, or they come direct to you?

Col. McRoberts. It is only a question of getting the details for making up the statement. I could not make such a statement from memory.

PROCUREMENT OF ORDNANCE MATÉRIEL.

(See pp. 318, 348.)

Mr. **Borland.** You get Gen. Pershing's requisitions for raw material?

Col. **McRoberts.** Yes, sir.

Mr. **Borland.** And you fill them?

Col. **McRoberts.** Yes, sir.

Mr. **Borland.** So that your records would show the raw materials furnished.

Col. **McRoberts.** Yes, sir.

Mr. **Borland.** It appears from this list that you purchased a good deal of raw material which is then turned over to private manufacturers.

Col. **McRoberts.** Yes, sir.

Mr. **Borland.** In other words, your contracts with the private manufacturers must include the furnishing by the Government of certain raw materials?

Col. **McRoberts.** Not always, but in most of them, probably. We always reserve the right to furnish raw materials, and in many cases we do furnish them.

Mr. **Borland.** So that, for instance, when you place an order for shell, for guns, or gun carriages, you may in your contract provide that the Government shall furnish the steel?

Col. **McRoberts.** Yes, sir. As a matter of fact, I think we do in most cases.

Mr. **Borland.** And the ultimate cost or price of the finished article to the Government depends somewhat upon the price at which you are able to get raw materials?

Col. **McRoberts.** Yes, sir; but the prices of the raw materials in these cases are fixed by the War Industries Board.

Mr. **Borland.** In that case, what is the nature of your contract with the individual contractor?

Col. **McRoberts.** Well, the first contract, apart from the raw materials, would be for the forgings. We furnish the steel to the forger and he charges a fixed amount for the finished forgings.

Mr. **Borland.** He charges a fixed price for the finished forgings?

Col. **McRoberts.** Yes, sir.

Mr. **Borland.** And the Government furnishes the steel?

Col. **McRoberts.** Yes, sir. It may be that the contractor who buys the raw material carries through to completion a finished unit of material, or it may be that he only makes the forging. In that case the forging, in turn, is delivered to the man who has the machining contract, which is also so much per shell. As a rule, the machine contractor furnishes and attaches the copper band. Then, there is probably a second contractor who makes the fuses and shell cases, or the shell case may be made separately. In other words, the contractor for each element makes up the finished shell, but in all cases we reserve the right to furnish the raw material to them, and they charge fixed prices for the work that they do.

Mr. **Borland.** How is that fixed price arrived at?

Col. **McRoberts.** It is arrived at partially by competition, partially by records that they have made on earlier manufacturing, and the best estimates that can be obtained, with the idea that the manufacturers' profits shall be limited around 10 per cent, or less; not to exceed 10 per cent. The conditions under which the various contracts are made are very different; but, of course, we are beginning to straighten them out, and when we get through with the first contracts the matter will become much simpler, because we will have our records. Practically all of our shells are made under fixed-price contracts.

Mr. BORLAND. Beginning with the forgings, which is the largest and most important element, I suppose, at the beginning of the war practically all of the forgings came from Midvale and Bethlehem, did they not?

Col. MCROBERTS. Shell forgings; yes, sir. The largest amount came from Bethlehem. The bulk of it came from there, although there were some other contractors. The American Can Co. made some forgings, and, I think, the American Car & Foundry Co. made some. There were some other contractors that had been working on English and French materials.

Mr. BORLAND. There were some other plants able to make forgings of different kinds, and they had devoted their facilities to making forgings for the English and French?

Col. MCROBERTS. Yes, sir.

Mr. SLEMP. That was the case with Bethlehem?

Col. MCROBERTS. Yes, sir; that was true of Bethlehem.

Mr. SLEMP. That was the case exclusively with Bethlehem?

Col. MCROBERTS. Yes.

Mr. BORLAND. Have we been able to develop a larger forging capacity since?

Col. MCROBERTS. Yes, sir; on a very large scale.

Mr. BORLAND. How many forging plants can you look to now?

Col. MCROBERTS. I could make up a list of the forging plants, but I could not answer that from memory.

Mr. BORLAND. It would not be a great many?

Col. MCROBERTS. Yes, sir; there are a large number of them, taking all classes of forgings.

Mr. BORLAND. Well, take, for instance, gun forgings.

Col. MCROBERTS. The gun forgings would be limited. I could give you a list of the forging contracts on any particular type of gun.

Mr. BORLAND. What class of forgings are being made by the Illinois Steel Co.?

Col. MCROBERTS. The Illinois Steel Co. is making ingots for gun forgings, and I do not believe any outside of that.

Mr. BORLAND. Then there is a forging concern at Rochester?

Col. MCROBERTS. The Symington-Anderson Co. are not doing any forging. They are only finishing.

Mr. BORLAND. Are there any forgings manufactured at our arsenals?

Col. MCROBERTS. Yes; at Watertown. I do not believe there is any at Rock Island.

Mr. BORLAND. Are they making forgings for the guns or for the accessories?

Col. MCROBERTS. Both. I am not certain about shells.

Mr. BORLAND. It was proposed here a year ago to put in a forging plant, I think, at Watertown. Has that plan been carried out?

Col. MCROBERTS. Yes; it has. I was just trying to recall the forging capacity there, but I can not recall it offhand. We are now putting in a 2,000-ton press in addition to the 1,000 and one 2,000 ton presses already installed. There is some gun forging at Watertown for the 155-millimeter gun and 240-millimeter howitzer.

Mr. **Borland**. They make their own forging and machine the gun?

Col. **McRoberts**. No. They forge, rough machine, and heat treat.

Mr. **Borland**. What is their capacity?

Col. **McRoberts**. I can not tell you. On the gun forging we figure on a capacity of 2,400 tons per month.

Mr. **Borland**. How are they getting along with those forgings?

Col. **McRoberts**. They are just starting in. They made five in May, as I understand, and they do not really get into full quantity production until September.

Mr. **Borland**. How are they getting along with the gun forgings at the Illinois Steel Co.?

Col. **McRoberts**. They make ingots only at this company.

Mr. **Borland**. Have they commenced deliveries?

Col. **McRoberts**. Yes; they have commenced deliveries.

Mr. **Borland**. What forging concerns that were making forgings for the British and French have we been able to employ?

Col. **McRoberts**. For what material?

Mr. **Borland**. For gun forgings.

Col. **McRoberts**. I have not a list of what the British have here, but I can say positively the Bethlehem and the Midvale, and I think the Edgewater Steel Co. were the ones the British used for gun forgings.

Mr. **Borland**. Were the French having any forgings made here?

Col. **McRoberts**. Yes; 75 m/m tubes from Bath and jackets from Midvale.

Mr. **Borland**. Colonel, how are you getting along with placing your orders for gun carriages?

Col. **McRoberts**. They are all placed.

Mr. **Borland**. What is the capacity of the country in that respect?

Col. **McRoberts**. The theory on which they were placed was that we placed our capacity to produce all these types of guns by the 1st of January. There have been some delays, as you know, in the initial stages, which in some cases will delay us. However, Col. Tripp can give you the details. I mean the present program.

Mr. **Borland**. Do you mean the present program that is now appropriated for or the program for which appropriations are being asked?

Col. **McRoberts**. I mean the one which has been appropriated for and which is contracted for. In other words, we contracted on the basis of capacity that would produce this by the end of December. I have a list here of where we have placed them and the capacity of each, if you want to go into that.

Mr. **Borland**. How long a list is it?

Col. **McRoberts**. Well, it is pretty long. For instance, there [indicating] is the 75-millimeter page. To get all the elements—carriage, recuperator forgings, gun forgings, finished recuperators, and finished guns, it all goes to make up quite a list.

Mr. **Borland**. Where is the Wisconsin Gun Co. located; at Milwaukee?

Col. **McRoberts**. Yes; just outside of Milwaukee, at West Alice.

Mr. **Borland**. What is this list supposed to be, Colonel—a list of the deliveries or of the expected deliveries?

Col. McROBERTS. They are the contract deliveries.

Mr. BORLAND. This first sheet, 75-millimeter, model 1916, American, refers to the carriage, does it?

Col. McROBERTS. That is indicated at the end of the page. That refers to the entire gun and the various items that make up the gun.

Mr. BORLAND. Under this the Rock Island Arsenal has begun deliveries of carriages. They were to deliver 20 in February.

Col. McROBERTS. That is the contract for delivery, but not the performance. Col. Tripp is the one to tell you about the performance.

Mr. BORLAND. How does the performance check up with this?

Col. McROBERTS. As a matter of fact, I think I have that here. At Rock Island they delivered one in February and nine in March. I have not the record for April.

Mr. BORLAND. The Bethlehem Steel is indefinitely postponed on account of the order for the 18-pounder?

Col. McROBERTS. Yes.

Mr. BORLAND. How are the New York Airbrake people getting along with their deliveries?

Col. McROBERTS. None to date. Yes; 16 in April was the first delivery.

Mr. BORLAND. Now, on gun forgings, the Buckeye Steel Co., where are they?

Col. McROBERTS. Columbus, Ohio.

Mr. BORLAND. What does this 127 mean? Is that the total amount of the order given?

Col. McROBERTS. That is the number of sets of model 1916 75-millimeter guns they are building.

Mr. BORLAND. What does this 127 under each month mean?

Col. McROBERTS. The total is 127.

Mr. BYRNS. Colonel, in regard to the deliveries to which you have just referred for the months named, I notice that they are very far below the number which was contracted for. I assume when the contract was made it was expected they would be able to make deliveries somewhere near the amount of the contract.

Col. McROBERTS. Yes.

Mr. BYRNS. I was curious to know just why they had fallen down so badly.

Col. McROBERTS. Well, there are a good many reasons for it. All last winter there were the questions of transportation, of fuel, and all that worked very much against the contractor, and some of these contractors had a great deal of difficulty with their labor and with housing facilities in some cases, and in some cases they had undertaken too much and could not get the men they contemplated they could get; all the usual labor troubles coupled with severe conditions of transportation and fuel, and in some cases delays in designs, and all the usual things that happen when a manufacturer tries to do a new thing. However, Col. Tripp can tell you more about that than I can.

Mr. BYRNS. Is there anything in your contract which takes care of a situation like that; in other words, is there any penalty in your contract?

Col. McROBERTS. Not as a rule, because the conditions under which these contractors went into this work made it almost impossible for them to guarantee a delivery. The only thing they could do was the best they could. You see there were very many things—if you go back and recall the conditions of a year ago—in the first place, the price of steel was not fixed, the price of labor and the Government's attitude toward labor was unsettled; we were in the throes of appointing a Fuel Administration; and all those things made it practically impossible for a contractor to be able to say when he could accomplish a given thing, and the results show that he was wise in not doing it.

Mr. BYRNS. And you contracted for this number, hoping to get just as many as they could deliver?

Col. McROBERTS. Not quite that. What they could do was very carefully considered.

Mr. BYRNS. But the delivery of 1 gun, for instance, out of 20 contracted for in one month——

Col. McROBERTS (interposing). That one gun may give them more trouble than they will encounter with all the rest of the guns put together. After you get quantity production going your troubles are over.

Mr. BORLAND. That happened to be at our own arsenal.

Mr. BYRNS. Well, take some of the other arsenals.

Col. McROBERTS. That arsenal has not done any better than the others.

Mr. BORLAND. The air-brake people were to deliver 50, and did not get any delivered.

Col. McROBERTS. There were some delays about getting material. However, as I said, Col. Tripp can explain those difficulties to you better than I can.

Mr. BORLAND. I take it this [indicating] is the first contract delivery, and by February they should have delivered 100, and by March 155, and by April 215, and so on, and by July they should have delivered the full 400?

Col. McROBERTS. Yes.

Mr. BORLAND. Colonel, are our arsenals running at their full capacity on these various orders?

Col. McROBERTS. Substantially; the arsenals are not only running at their full capacity but they have been making very great expansion of their capacity, limited only by what they estimate to be the labor conditions. There are some items which I think at times we could increase. I mean, they are not quite full in some items, temporarily, at least.

Mr. BORLAND. How many shifts are they working?

Col. McROBERTS. I can not tell you; I do not know.

Mr. BORLAND. You do not have charge of that?

Col. McROBERTS. No.

Mr. BORLAND. How do you deal with the arsenals?

Col. McROBERTS. We place an order with them just the same as any other manufacturer.

Mr. BORLAND. How do you know when they are willing to take an order?

Col. McROBERTS. Through correspondence with them. They regularly inform us. For instance, the commander of the Rock Island Arsenal was here the other day, and said he could take on additional amounts of work in certain departments, for certain things you are not concerned with, equipment matters. He thought he could take additional orders there. Col Blunt keeps closely in touch with them, and if he sees that they are running off a contract he calls it to our attention. There is about the same interest as with a private manufacturer.

Mr. **Borland.** Colonel, what class of these goods or materials are you able to get competitive bidding on; very many of them?

Col. **McRoberts.** Commercial goods we can often get competitive bidding on, or on things closely resembling commercial goods. If it concerns commercial goods that can be obtained in the market and are very well known, and the manufacturers are willing to compete, we get it by competitive bids. We get a great deal of our material by competitive bids. Take, for instance, a great deal of trench-warfare material and field-artillery tools innumerable, and equipment material, I think most of that is by competitive bids.

Mr. **Borland.** I take it that this raw material you buy, like pig lead, copper, zinc, steel, and antimony, is bought at a fixed price, fixed by the War Industries Board?

Col. **McRoberts.** Yes. Wherever we see a chance we buy it at a less price, but we can not go above it. For instance, we have bought a great deal of lead during the last six months below the fixed price.

Mr. **Borland.** Where the material is made according to the designs furnished by the Ordnance Department you are not able then, I take it, to secure any competitive bidding?

Col. **McRoberts.** Yes; on a great deal of it we do.

Mr. **Borland.** What class of material is that?

Col. **McRoberts.** Well, it is quantity production of a simple nature, where the manufacturer can quite definitely determine to his own satisfaction the cost of it; for instance, hand grenades, drop bombs, cartridge belts, and things of that sort that are simple and made in large quantities, and all the equipment stuff like cans, knives, and forks.

Mr. **Borland.** They are general ordnance stores, but I take it that in these lines of Field Artillery and Field Artillery ammunition you are not able to obtain any competitive bidding on that material.

Col. **McRoberts.** Not in the sense of public offering; no.

Mr. **Borland.** What class of contracts do you make, then?

Col. **McRoberts.** We make fixed-price contracts for the completed shell. We do that wherever we can. Of course, people equipped to make a completed shell are very limited. Then we go to the assembling proposition, where we make contracts for forgings, for machining, for fuses, and for loading. They may all be separate contracts. Those are at fixed prices, because we have been able to determine pretty well what the cost is.

Mr. **Borland.** Do those contracts involve your furnishing the material?

Col. **McRoberts.** Yes.

Mr. **Borland.** In practically every case?

Col. **McRoberts.** Yes; practically every case. We do not always furnish the material, but we reserve the right to furnish the material and in every case the material has to be cleared through the War Industries Board.

Mr. **Borland.** And the fixed price relates to the cost of manufacture?

Col. McRoberts. Yes.

Mr. Borland. How are your gun forgings made? Are they made under the fixed-price plan?

Col. McRoberts. Well, it is rather complicated. I think I have a statement here that may answer that question. The artillery ordered is divided into five different classes, cost plus a fixed profit, with an allowance for increased facilities, which facilities belong to the Government and are owned by the Government at the end of the contract; then a fixed price, the Government to own the plant, but the contractor to buy it at a predetermined, depreciated value, either on installments or by lump sum at the end of the contract; then fixed-price contracts, where increased facilities are furnished and owned by the Government and are owned by the Government after the execution of the contract; cost-plus percentage contracts with a maximum fixed profit and increased facilities furnished, which the Government owns both during and after the execution of the contract; then cost plus a fixed profit changing to fixed price after manufacture of a reasonable quantity; and fixed prices with no increased facilities furnished by the Government.

That gives you a little idea of the combinations you have to form to meet the particular conditions. Under the first item for artillery we have spent $186,000,000, and under the second item a small amount, and under the third item $25,000,000, and under the fourth $12,900,000, and under the cost plus a fixed price changed to a fixed price afterwards, only $2,000,000, and under the fixed price $255,000,000, the latter being about half of the entire amount. You have to switch those around to meet the different conditions of the contractors, which we try to do.

Mr. Slemp. You have found the manufacturer favorable to the percentage plan rather than the fixed price, have you not, Colonel?

Col. McRoberts. No, sir. They do not like it. They come to it only as a matter of necessity, because it deprives them of the position of being an independent manufacturer. It puts them too much in the class of superintending a Government plant, and they do not like to do it; and I do not believe they like it any better than we do. We do not like it because we do not think it is a scientific arrangement.

Mr. Slemp. Does the fixed price usually involve more than 10 per cent profit over the cost?

Col. McRoberts. No; I should say it usually involves less.

Mr. Slemp. Then they would be making a sacrifice to accept a fixed price contracts?

Col. McRoberts. They do not have so much interference. They are very much irritated—I do not know that I should say irritated—but interfered with by the great quantity of Government accounting and the difficulty of making up their bills and all that. Some of them complain that the plant is full of Government men, and that their work is interfered with. They like to be independent, and we would like to have them that way, too, with a full incentive to do the work as cheaply and quickly as possible.

Mr. Slemp. How do these prices compare with the prices paid the Government arsenals?

Col. McRoberts. You mean what the Government work costs at the arsenals?

Mr. **Slemp**. Yes; as compared with what you get under these other plans.

Col. **McRoberts**. Of course, it is too early to make a very definite statement about what the material costs, because on a cost-plus contract you can only determine that after you are through and have taken an inventory and settled the proposition. We have estimates, of course, as to how it is running, and I should say that the cost-plus plan has probably saved the Government some money.

Mr. **Slemp**. Is it also a speedier method of getting results?

Col. **McRoberts**. No; I do not think so. I think it is rather otherwise, because it rather interferes with production.

Mr. **Slemp**. You think the Government arsenal would produce or would manufacture a gun quicker than the private manufacturer?

Col. **McRoberts**. No; I do not think that. I think the private manufacturer possibly would, because of better equipment or larger equipment or more experience, although Watervliet compares very well both with the Navy arsenal and the private arsenals in speed of production.

Mr. **Slemp**. And also in the cost?

Col. **McRoberts**. Yes.

Mr. **Borland**. This statement does not bear any date. It shows the allotment of $523,408,000. Do you know what particular appropriations that refers to?

Col. **McRoberts**. No. It was prepared at my request to show the percentages rather than anything else.

Mr. **Borland**. And brought it down to what date?

Col. **McRoberts**. I think that was down to a very recent date—May 1, 1918.

Mr. **Borland**. I notice it covers the field artillery, improvised seacoast artillery, and railroad mounts. That is the class of material it covers?

Col. **McRoberts**. I do not know. You can only regard this as a memorandum. I think it probably covers the entire contracting of that material, but it is not a financial statement.

Mr **Borland**. It was not drawn up with an idea of covering all the contracts which have been placed for any of the material; you did not intend to cover the whole of any one class of material?

Col. **McRoberts**. No, sir. This first statement was drawn up primarily for the purpose of comparison of the different types of contracts, and I suppose in drawing that up he had .to arrive at what represents the Artillery section, but the total amount of the contract on that basis, that is where the second sheet comes in.

Mr. **Borland**. According to this statement the fixed price with no increased facilities furnished by the Government those contracts represent $255,000,000, out of a total of $523,000,000?

Col. **McRoberts**. Yes, sir.

Mr. **Borland**. Or about 45 per cent. That refers, does it not, however, to the large contracts made with the Bethlehem and Midvale companies, who were already prepared to take orders for these forgings and machine-finished guns without any help from the Government?

Col. **McRoberts**. It includes them. That is the largest amount. Also contracts with the Washington Steel & Ordnance Co.

Mr. BORLAND. Are they doing forgings?

Col. McROBERTS. They are making armor piercing shells, and I think they have their own forging plant. They have had large contracts.

Mr. BORLAND. They are not asking any help from the Government?

Col. McROBERTS. No, sir. We give them help in the way of advances on their contracts, but not in the building of plants.

Mr. BORLAND. That is, taking contracts at a fixed price without any additional facilities furnished by the Government?

Col. McROBERTS. Yes, sir.

Mr. BORLAND. The next largest amount is under the class of cost plus fixed profit with allowance for increased facilities, which facilities belong to the Government and are owned by the Government at end of contract, and under that the contracts amount to, materiel $186,000,000, and the contracts for increased facilities at plants $42,000,000. What class of facilities are those?

Col. McROBERTS. Those are extensions of existing plants, or, I think, in most cases really new plants. In other words, alongside or adjoining their present plants so the same organization could be extended over the operation of the new plant.

Mr. BORLAND. Have you in mind any companies operating under that kind of a contract?

Col. McROBERTS. Yes, sir. There are a great many of them. Take the American Brake & Foundry Co.

Mr. BORLAND. These are not shell contracts, are they?

Col. McROBERTS. They are primarily shell contracts. The American Brake Shoe & Foundry Co., the Willys-Overland Co., the American Car & Foundry Co., the Pressed Steel Car Co., I think the Wisconsin Gun Co., Dodge Brothers, the Minneapolis Steel & Machinery Co., and the Bullard Engine Works, of Bridgeport. They run into a very large number.

Mr. BORLAND. The facilities that are furnished by you are extensions of plant and not such things as machine tools.

Col. McROBERTS. They are machine tools. It may mean an extension of the plant also.

Mr. BORLAND. An extension of the plant would not be of much value to the Government at the end of the contract?

Col. McROBERTS. Probably they will not be; merely surplusage.

Mr. SLEMP. When you make a contract on the 10 per cent basis is that sufficient to amortize the plant?

Col. McROBERTS. No, sir.

Mr. SLEMP. In the case of the guns it would not be of much use?

Col. McROBERTS. It would not amortize their plant, but in the cost they are permitted to charge a fixed rate upon the value of their plant investment.

Mr. SLEMP. For repairing the plant?

Col. McROBERTS. No; only rental for the plant.

Mr. SLEMP. The loss would really come pretty heavily upon the man who built up a plant?

Col. McROBERTS. He can not do it. That is why it is necessary for the Government to lend that aid.

Mr. BORLAND. What is the fixed profit allowable under these contracts?

Col. McRoberts. We have a general standard that it shall not exceed 10 per cent. That has not always been adhered to.

Mr. Borland. You do make contracts lower than that?

Col. McRoberts. As a rule, they are lower; yes, sir. It depends on the material. In the case of guns I should doubt that. I think in some cases, the early contracts especially, were higher than 1 per cent on gun contracts. That class of material is more difficult and one would expect a larger return, but when you take the great mass of contracts, it has been below 10 per cent.

Mr. Borland. Are the cost-plus fixed-profit contracts now being made?

Col. McRoberts. No, sir; not where we can get away from them. They are being made less and less as time goes on.

Mr. Borland. Most of the contracts of that class in existence were made at the earlier stages?

Col. McRoberts. When you could not do anything else. There was no way of determining what much of this material was going to cost and there was no way of getting the contractors under those circumstances to undertake it except on some such basis.

Mr. Borland. You are getting away from that system?

Col. McRoberts. Wherever we can.

Mr. Borland. Are you making many of those contracts at the present time?

Col. McRoberts. No. All the small-arms contracts are cost-plus. We have never been able to get away from that for various reasons. Practically all of the shell contracts are fixed-price.

Mr. Borland. How about the big-gun contracts?

Col. McRoberts. I should say that they were mostly cost-plus, outside of the Bethlehem and Midvale. The majority of the contracts are cost-plus, falling within one of four or five classes.

Mr. Borland. Do you have any way under the cost-plus contract of supervising the cost?

Col. McRoberts. Yes, sir: the cost-accounting system.

Mr. Borland. Have you anything to say as to what the cost shall be: do you consult as to what they should pay for labor or material?

Col. McRoberts. A great many of the contracts have a limitation that they can not pay more than the prevailing rate of wages without the consent of the contracting officer. In some cases they have attempted to fix the rate. That has not been very generally followed and is very difficult to do. Most of them are subject to the approval of the Government where the plant facilities are furnished.

Mr. Borland. But is there not a temptation on the part of the contractor, in spite of that, to pay higher wages, on the theory that he does not have to pay the wages and gets 10 per cent on the top?

Col. McRoberts. That is one of the defects.

Mr. Borland. Have you any way of supervising that and correcting the evil?

Col. McRoberts. Not effectively, except by appeal to the contractor. I have not, of course, gone into the matter fully, as it belongs to the production division, but I do not think there are many cases of flagrant use of that power. As a rule, the contractor does not want the rate of wages to rise at his plant. He is either doing other work or expects to do it, and he does not want to get the labor market abnormally high. There is a natural check to his exercising that power.

Mr. BORLAND. That little tug at his heart is a good deal less than the other way when he gets 10 per cent on top?

Col. MCROBERTS. Not if he has an established business.

Mr. BORLAND. If he hires a man at $9 a day, he gets 90 cents; and if he hires him at $6 a day he only gets 60 cents.

Col. MCROBERTS. If he has an established business of which this Government business is only a part, his interest is to keep the rates down. If it was an independent operation, we would have no check. That is one of the defects of that kind of a contract.

Mr. GOOD. How do you determine the price where the Government owns a plant and the contractor agrees to purchase it at a predetermined depreciated value?

Col. MCROBERTS. That is by agreement.

Mr. GOOD. What basis would you use?

Col. MCROBERTS. It is rather difficult to say. It depends a great deal on the condition of the particular plant. It would be limited by what the Government and the contractor agreed to what extent the plant would be useful after the war.

Mr. BORLAND. I take it you do not have many of those contracts?

Col. MCROBERTS. No, sir.

Mr. BORLAND. Could you give the committee any idea how great the depreciation runs on those plants?

Col. MCROBERTS. Yes. Take a by-product coke oven—I think that falls in some of the fortifications appropriations—a by-product coke oven could be built as low as $11,000 before the war; the average would be higher than that. It costs from $35,000 to $40,000 now. If we asked a contractor to build and operate a coke oven and to pay that portion of it that it would be reasonably worth after the war, it would of course be materially less than $40,000. We have contended that it would be fair to say that it would be worth $25,000. We have not found many contractors to agree with that price, but some agree on $20,000. In other words, 50 per cent of the present cost. That is an extreme case. I do not believe there are many of the facilities where we would have to have a value as low as 50 per cent, but we can not get the contractors to agree to any value in many cases.

Mr. BORLAND. Fixed price, Government to own plant, but contractor to buy it at a predetermined depreciated value, either on installments or by lump sum at end of contract, $2,160,000. That looks like it might be confined to one or two plants.

Col. MCROBERTS. Likely.

Mr. BORLAND. Do you recall what they were?

Col. MCROBERTS. No, sir; I do not recall, but, as you can see, that is probably an integral part of the plant which would be useful with the plant after the war, and which probably would be difficult to separate. In only such cases could we get a contractor to make that form of agreement.

Mr. GOOD. Where it has been on a fixed profit with allowance for any increased facilities furnished by the Government and owned by the Government, on what basis are the contracts made?

Col. MCROBERTS. From 5 per cent to 10 per cent, I should say, depending on the conditions.

Mr. **Slemp.** I notice that the Railroad Administration are buying their cars and engines on a 5 per cent basis of the cost of plant.

Col. **McRoberts.** I do not know what the basis was. Of course, you get all kinds of contracts. We have just concluded a contract with a steel company for this big gun factory, where they do it for nothing, for $1, build and operate it as long as we want them to operate it. On the other hand, we get people who make contracts strictly as a business proposition.

Mr. **Borland.** Do your contracts provide for cancellation after the war?

Col. **McRoberts.** In all cases.

Mr. **Borland.** And the contractor has to take the risk of having the whole contract canceled?

Col. **McRoberts.** He is protected by the conditions of the contract.

Mr. **Slemp.** Do your contracts contain an arbiter clause for adjustment?

Col. **McRoberts.** As a rule they can only appeal to the contracting officer, to the Chief of Ordnance, and then finally to the Secretary of War.

Mr. **Borland.** Where you give an order for some guns, are you not definitely bound to take the guns?

Col. **McRoberts.** If they are completed. Cases like that we handle in this way: We give an order for 100 guns, which can be canceled, however, at any time at the option of the Government or at the close of the war, or when they decide that they do not want the guns. In other words, if the Government does not want the guns, we pay for the uncompleted guns, and it is stated in advance on what basis they shall be paid for.

Mr. **Borland.** How do you pay for them?

Col. **McRoberts.** We pay for the raw material and the work up to a certain point, plus probably a profit.

Mr. **Slemp.** That is where I thought the arbiter would come in.

Col. **McRoberts.** As a rule he has to take his chances with the Government or go to the Court of Claims.

Mr. **Borland.** The next class is cost plus percentage contracts, with the maximum profit fixed and increased facilities furnished, which the Government owns both during and after execution of contract. That is the fourth largest in the list. How much is the percentage allowed on that class of contracts?

Col. **McRoberts.** I do not recall the particular contracts. The theory is that you give them a cost plus 10 per cent and limit the total profit they can make on the contract to a certain amount. It depends a great deal on the speed with which they must produce.

Mr. **Borland.** Cost plus fixed profit, changing to fixed price after the manufacture of a reasonable quantity, $2,000,000. I suppose that is confined to one or two?

Col. **McRoberts.** Probably small contracts.

Mr. **Borland.** Do you find that by means of these various forms of contracts you are able to encourage production up to the point necessary to produce the guns required by this program?

Col. **McRoberts.** Of course, these are only the forms that particularly apply to artillery. There are many other forms. What we try to do is to find the most economical way of arranging for the production of this material. Sometimes we have to modify our plans to meet the particular notions of the contractor. If we find that he can be pleased by a different arrangement that does not cost any more to the Government, we try to adapt ourselves to his notion. It sometimes involves questions of resources, capital, and so forth.

Mr. **Borland**. What sort of financial aid do you furnish?

Col. **McRoberts**. The law permits us to advance up to 30 per cent on the price of the estimated cost of the material.

Mr. **Borland**. At what stage are you permitted to do so?

Col. **McRoberts**. Upon the execution of the contract. However, certain conditions attach to it. It is upon satisfactory security.

Mr. **Borland**. Up to 30 per cent.

Col. **McRoberts**. Yes, sir; immediately upon the execution of the contract. He pays interest on it, and so I do not think he takes any more than he has to. Very seldom does anybody take 30 per cent. It may go up to that.

Mr. **Borland**. What interest does he pay?

Col. **McRoberts**. That is fixed by a board. At the present time it is 7 per cent. That is done for the purpose of inducing a man to go to his bank instead.

Mr. **Borland**. If a man wants to pay that high interest he must need the money pretty badly?

Col. **McRoberts**. That policy was fixed as the policy of the Treasury of the United States. I doubt if it is of any particular advantage to the Government, because the contractor would naturally figure that in his cost.

Mr. **Borland**. If his paper was good, he could have it rediscounted at a Federal reserve bank much cheaper?

Col. **McRoberts**. The idea of the Treasury was to have him go to the bank, if possible, and not make it too easy.

Mr. **Good**. I suppose he only resorts to the Government when his credit at the bank has been exhausted?

Col. **McRoberts**. The idea of the statute was to assist the contractor when he needed it, but not when he did not need it.

Mr. **Borland**. It might be that the opposite policy would be more advantageous and relieve the banks by permitting him to be financed out of the money appropriated for the purpose?

Col. **McRoberts**. That would bring a flood of requests for advances.

Mr. **Borland**. Would that aid you in placing contracts?

Col. **McRoberts**. It would raise objections on the part of the other departments of the Government.

Mr. **Borland**. It seems to me if we allowed the Government to advance money out of the appropriation to pay for the material and to advance it at a low rate of interest, if the man was sound, that that would aid in making additional contracts.

Col. **McRoberts**. That policy was not fixed in the Ordnance Department: it was fixed higher up. But I can say this as against that method: That if people who could readily do their own financing should come and get these advances it would put the Government, in a way, in the banking business and make an unnecessary drain on the Treasury.

Mr. **Borland**. Can you give the committee a statement as to how much money has been advanced and the amount that is outstanding at the present time?

Col. McRoberts. Yes, sir. It is something like—I do not know how much of it is outstanding, but the total advances up to date will amount to something over $150,000,000, I believe.

Mr. Borland. Are those advances made on your O. K.?

Col. McRoberts. No. There is a war credits board which passes on these advances; that is, they pass on the applications; but no one can make an application for an advance except through the contracting officer of one of the departments of the War Department.

Mr. Borland. So the contractor must first come to you and get your O. K. for such an advance?

Col. McRoberts. Yes, sir.

Mr. Borland. Then he goes before the war credits board?

Col. McRoberts. Yes. We join with the contractor in requesting that such an advance be allowed.

Mr. Borland. When an advance is made it is made out of the appropriation set aside for the purchase of that particular material?

Col. McRoberts. It is an advance payment on the contract.

Mr. Borland. And that is the policy that is carried out in other departments of the Government as well as in your department?

Col. McRoberts. In the War Department. It is different in the Navy Department; they have a different method.

Mr. Borland. That applies, however, to the Quartermaster Department?

Col. McRoberts. Yes; all the divisions of the War Department.

Mr. Borland. Is this the only form of financial aid that you give to these contractors?

Col. McRoberts. Well, what you would call strictly financial; yes.

Mr. Borland. What was your arrangement with Symington?

Col. McRoberts. I do not recall that, because it was made before I came here, and I never had occasion to go into it carefully. I will be very glad to look it up and let you know. I think it comes within that class of contracts—that is, the Government practically furnished his plant.

Mr. Borland. The Government practically built him a plant, did it not?

Col. McRoberts. Yes. I have not examined the contract in detail, because it was one of the contracts made before I came here.

Mr. Borland. He is located at Rochester, N. Y.

Col. McRoberts. Yes. But the Government built that plant.

Mr. Borland. He is operating it?

Col. McRoberts. Yes.

Mr. Borland. With a cost plus fixed profit?

Col. McRoberts. I think so; yes, sir.

Mr. Borland. Who made that contract?

Col. McRoberts. That was made early last summer, and I suppose it was made by Col. Hoffer.

Mr. Borland. What class of work is he doing?

Col. McRoberts. The machining of guns and shells.

Mr. Borland. Did he have any plant there of his own?

Col. McRoberts. Yes; there was a Symington Machine Co. I do not know whether it was at the same place or not, but he was in business.

Mr. Borland. What kind of a plant did he have?

Col. McRoberts. I think it was a shell plant; I do not think he was in the gun business before we entered the war.

Mr. Borland. He was not making shells for us?

Col. McRoberts. No.

Mr. Borland. But making shells for somebody else?

Col. McRoberts. Yes, sir.

Mr. Borland. Can you give us detailed information as to what kind of a plant was built there and how much it cost?

Col. McRoberts. No; I can not.

Mr. Borland. Who can give it to us?

Col. McRoberts. I can by obtaining it from the records.

Mr. Borland. That is what I meant.

Col. McRoberts. Oh; yes, sir.

Mr. Borland. I think we would like to know what sort of a plant was built there.

Col. McRoberts. We will furnish that information.

Mr. Borland. That is the biggest item there is of facilities furnished, $42,000,000. That is contained under that particular class, but how much of that is Symington I do not know.

Col. McRoberts. That is only on artillery. Suppose I read to you a list of the specially furnished plants, and then you can tell me to what extent you are interested. The ammonium nitrate plant at Perryville.

Mr. Borland. These are Government plants, and we will go over them separately. I am asking you now about facilities furnished to private companies.

Col. McRoberts. This is a private contractor, the Atlas Powder Co.

Mr. Borland. The Perryville plant is one we are going to own, is it not?

Col. McRoberts. We own the plant entirely, but the contractor is to build it and operate it.

Mr. Borland. The Atlas Powder Co. is to manage it as the Government's agent?

Col. McRoberts. Yes. We own the Simonton plant, too.

Mr. Borland. That is what we want to find out.

Col. McRoberts. Then we have a T. N. T. plant——

Mr. Borland (interposing). Because the Simonton plant does not appear among our Government-owned plants, and the one at Perryville does.

Mr. Borland. I have quite a list of the plants that the Government owns.

Col. McRoberts. We have a T. N. A. plant at Boundbrook, N. J. The Allied Silk Trading Corporation——

Mr. Borland (interposing). Where is that corporation located?

Col. McRoberts. At 17 Madison Avenue, New York City. We have bought through them about 6,900,000 yards of silk.

Mr. Borland. What is the silk used for?

Col. McRoberts. For powder bags.

Mr. Borland. What facilities have you furnished there?

Col. McRoberts. None. We are planning extensions for them there that will cost us about $225,000 for increased spinning facilities, and to be Government owned. They buy the raw silk and make this silk cloth at various plants.

Mr. **Borland**. Is that on a cost-plus basis?

Col. **McRoberts**. Yes. The compensation was 7½ per cent. a after operating for some six months they voluntarily reduced th compensation to 3 per cent, reserving the right to further reduce They say they only expect to come out whole on the propositi Then we have picric-acid plants at Niagara Falls, Little Rock, Ark. Brunswick, Ga., and possibly in the future Knoxville, Tenn.

Mr. **Borland**. Where is the picric-acid plant you first mentione

Col. **McRoberts**. Perth Amboy, N. J.

Mr. **Borland**. That is already in operation.

Col. **McRoberts**. That is in operation and is operated by Goo rich, Lockhart & Co.

Mr. **Borland**. Is that a Government-owned plant?

Col. **McRoberts**. That plant extension cost the Government $1 940, and Goodrich, Lockhart & Co. will own it; it will be absorb in the price.

Mr. **Borland**. And the Government built it?

Col. **McRoberts**. They deliver picric acid for the plant. In oth words, it is an extension of their present plant.

Mr. **Borland**. The Government built it at a cost of $150,000?

Col. **McRoberts**. $158,500, was put in that plant.

Mr. **Borland**. Out of what appropriation was that done, do y know?

Col. **McRoberts**. No; I really do not know.

Mr. **Borland**. That picric acid is all to be delivered to the Frenc

Col. **McRoberts**. It may not be; it may be used for gas.

Mr. **Byrns**. Italy and France.

Col. **McRoberts**. I think this particular picric acid is being u as a part of the raw material in gas making, but I am not certa about that.

Mr. **Borland**. In the making of noxious gases?

Col. **McRoberts**. Yes.

Mr. **Borland**. Then you have one at Niagara Falls?

Col. **McRoberts**. Yes. That is the Hooker Electric Co. and th is Government owned entirely. It cost $225,000, and is an additi in a way, to their plant. Then at Little Rock——

Mr. **Borland** (interposing). When you say it is Governm owned, what does that mean?

Col. **McRoberts**. Well, we own the plant, or eventually will, a will continue to own it after the war.

Mr. **Borland**. And they are conducting it as Government agent

Col. **McRoberts**. Yes, sir. At Little Rock, Ark., we are buildi a plant to cost $4,000,000.

Mr. **Borland**. The ones at Brunswick, Ga., Knoxville, Tenn., a Little Rock, Ark., are included in the new estimates, and, of cour you have not had the money for them.

Col. **McRoberts**. I have made the contracts for them so I ce tainly will need the money. I have a certificate that the money available, but I do not know from what appropriation or from wha funds they borrowed it. Those plants are rather interesting becau they are all placed on a little different basis of compensation.

The Davis Co. delivers acid at a fixed price plus so many cents—I have forgotten the exact figures—and 33⅓ per cent of what he can save below that; his entire profit, however, to be limited to 3 cents a pound—

3 or 4 cents, I am not certain which—but that is the theory of the contract. All of these prices are figured on a theoretical base for the raw materials. In most cases the Government will furnish the raw material and there is a variation there, but that is substantially the form in the three contracts. There is also a provision as to new discoveries, because there is a possibility of picric acid being made much cheaper. In that event we can order them to put in a new process. In that case they get an average compensation over their first 90 days' operations under the old processes if we order them to put in a new one.

Mr. GOOD. If the Government ordered a new process put in it would have to pay for it, would it not, because the Government owns the plant?

Col. MCROBERTS. Yes; and it would be a part of the cost of the plant. There is a possibility of picric acid being made for materially less than its present cost, and in that case we want to reserve that advantage to the Government. Then there are the chlorine plants, one at the Edgewood Reservation, one at Charleston, W. Va., and one at Philadelphia. They are small plants. One cost $375,000 and another $500,000. Then there is a T. N. T. plant at Barksdale, owned by the Du Ponts, for which we will pay $2,880,000 for increased facilities. The eventual ownership will be in the Du Ponts.

Mr. BORLAND. We have expended how much?

Col. MCROBERTS. $2,880,000.

Mr. BORLAND. In the construction of that plant?

Col. MCROBERTS. Yes, sir.

Mr. BORLAND. Is that its entire cost?

Col. MCROBERTS. Yes; I think that is its entire cost for the increased facilities.

Mr. BORLAND. And under what terms does it become the property of the Du Ponts?

Col. MCROBERTS. I do not exactly recall, but it is through the operation of the price we are paying. It is after the delivery of a certain amount at a fixed price, but I can not give you the terms from memory.

Mr. BORLAND. That is a T. N. T. plant?

Col. MCROBERTS. Yes, sir. At Hercules, Cal., we are building a plant, to cost $4,200,000, for the Hercules Powder Co., with a manufacturing capacity of three and a half million pounds. That plant will, in the end, be owned by the Hercules Powder Co.

Mr. BORLAND. And they are supposed to make a reduction in price?

Col. MCROBERTS. They give us that material at a fixed price which, when you have an amortization of the plant, makes a total price which is satisfactory to the Government.

Mr. BORLAND. Is there any market price for T. N. T.?

Col. MCROBERTS. No.

Mr. BORLAND. Is there any other purchaser of it except ourselves?

Col. MCROBERTS. Yes. England and France purchase it, but, of course, under our control, and, I suppose, Germany, if she had a chance.

Mr. BORLAND. But there is no private purchaser of it?

Col. MCROBERTS. No; none that I know of, and if there is such a purchaser the purchases would be so small that they would not amount to anything.

Mr. Good. Under such contracts you have to agree to take a given amount and you can not cancel that amount.

Col. McRoberts. Yes; we can cancel, but in that case there is an adjustment with the contractor.

Mr. Borland. Of what use would a $4,000,000 plant for the manufacture of T. N. T. be to the Hercules Co. if they have no other purchaser of the product?

Col. McRoberts. They do not think it is of any value to them at all, but here is the difficulty——

Mr. Borland (interposing). How much are they giving us credit for?

Col. McRoberts. It is an extension of their own plant. A T. N. T. plant must be broken up into small units over a big reservation, in order to avoid the risk of fire and explosion. Now, the most economical way that such a plant could be built was by putting it here and there throughout their reservation, and it will probably be of very little value to them and certainly of no value to the Government, but it is the most economical way we have of nitrating our tuluol in California.

Mr. Good. We have no Government owned and operated T. N. T plants such as we have for the manufacture of powder at the Picatinny Arsenal?

Col. McRoberts. No. We will have to build two such plants, although I do not know what they asked for in their appropriations.

Mr. Borland. They are asking for one?

Col. McRoberts. It is a question of building one or two smaller ones.

Mr. Borland. They are estimating for one T. N. T. plant, for which they are asking $17,000,000, and then they are asking for $8,000,000 additional for increased capacity, but they did not say whether that was a new plant or not.

Col. McRoberts. That probably means two. Then we have the nitrate plants; one at Sheffield, Ala.—that is, Muscle Shoals—there are really two there, one being built by the General Chemical Co., which is to use the Haber process, and one for the cyanamid process, which is No. 2. The first one is estimated to cost $13,000,000 and the second one $40,000,000. I would have been negotiating with them—if I were not here—for a third and fourth plant; one to be built at Toledo, Ohio, and one at Elizabethtown, Ohio. These two plants together are estimated to cost $40,000,000. Then we have the one at Perryville, which is to use the ammonium sulphate-nitrate (direct) process, as it is called and to be operated by the Atlas Powder Co., and that plant is to cost $8,000,000. I do not know the terms of the contract for the first one, because that was provided for by the nitrate division out of the nitrate appropriation, and I have never had occasion to examine it. I am quite familiar with the Muscle Shoal contract for the cyanamid process, because I have been negotiating for the third and fourth plants.

Mr. Borland. Briefly, what is the cyanamid process?

Col. McRoberts. It is not brief, and it is rather complicated. The beginning of it is the obtaining of nitrogen from the air, and it goes through a good many processes before it can be put into the form of ammonia.

Mr. BORLAND. All of the processes really have their basis in obtaining nitrogen from the air?

Col. MCROBERTS. Well, this last one has not, because in that we use sulphate of ammonia obtained from by-product coke ovens; that is the one I referred to as in the ammonia sulphate-nitrate process.

Mr. BORLAND. That is the one being built at Perryville?

Col. MCROBERTS. Yes, sir.

Mr. BORLAND. The other process is what you call the cyanamid process?

Col. MCROBERTS. Yes, sir.

Mr. BORLAND. And that process is one by which the nitrate is obtained from the air?

Col. MCROBERTS. Yes, sir.

Mr. BORLAND. That is the basis of it?

Col. MCROBERTS. Yes, sir.

Mr. BORLAND. Have you examined into that to such an extent as to be able to determine whether that process is cheaper and better than the process of obtaining it from by-product coke ovens and ammonia?

Col. MCROBERTS. Yes, sir; it is very much cheaper. When you consider the advantages I should say it was much cheaper, and it has the additional necessary advantage of making it possible to obtain purer ammonia, which is quite necessary in some of the high explosive combinations, such as amatol. We could hardly build enough coke ovens to produce the results of these three plants.

Mr. BORLAND. There would not be enough coke ovens in the country to produce the amount of those three plants?

Col. MCROBERTS. No. They will produce together 1,330,000 pounds daily.

Mr. BORLAND. Have you ony information as to what process Germany is using in getting her supply of nitrates?

Col. MCROBERTS. Yes; by the cyanamid process and by the Haber process. They have 37 nitrate plants.

Mr. BORLAND. In Germany?

Col. MCROBERTS. Yes; one being entirely under ground.

Mr. BORLAND. What sort of a plant is that?

Col. MCROBERTS. It is a cyanamid plant.

Mr. BORLAND. What material do you need to run a cyanamid plant outside of power?

Col. MCROBERTS. Well, we need coal.

Mr. BORLAND. You use coal for steam purposes?

Col. MCROBERTS. No, not altogether; pulverized coal is used in one stage of it, and then there is lime. I do not know of anything else, although there may be some minor chemicals used.

Mr. BORLAND. Is that the process in which they need platinum?

Col. MCROBERTS. Yes; they need platinum, because they make sulphuric acid in connection with it, and platinum is used in making sulphuric acid.

Mr. BORLAND. You say Germany has 37 nitrate plants?

Col. MCROBERTS. Yes, sir.

Mr. BORLAND. That is your information?

Col. MCROBERTS. That is my information, for whatever it is worth, although I would not say that is exact.

Mr. BORLAND. Have we any very accurate information on that subject?

Col. McROBERTS. I do not know; but I believe this information is correct.

Mr. BORLAND. Have you any idea as to how much her output is?

Col. McROBERTS. No; I have no figures regarding it.

Mr. BORLAND. Do you know how she operates those plants whether by steam power or how?

Col. McROBERTS. No; I have not any information on that. It would be by steam power, because they have no sufficient water power in Germany. The Haber process does not require much power, and it is assumed that by the operation of the Haber process the ammonium nitrate is made at a less cost, although we do not know exactly. While we know the principle of the process, we do not know the mechanical appliances that they are using to carry it out, and we are engaged in developing those mechanical appliances independently.

Mr. BORLAND. The Haber process is supposed to be the cheapest of all, it is not?

Col. McROBERTS. Yes, sir.

Mr. BORLAND. But you say we have not the full control of that process?

Col. McROBERTS. We know the process, but we do not know the mechanical details for operating it; therefore we are developing mechanical contrivances for operating it, which takes time. They think they will get it in operation this summer; they have already been able to make gas there.

Mr. BORLAND. You were giving a list of special plants.

Col. McROBERTS. Then, we have a large number of toluol plants, or by-products coke ovens, which were built up as a result of Government contracts but not by the Government.

Mr. BORLAND. What is the nature of our contracts with those toluol plants, or by-products coke ovens? What are the terms of the contracts?

Col. McROBERTS. They vary a bit. There are three bases. Like everything else, you can not find three men who want to do it the same way, and we try to be flexible in the Ordnance Department. It did not cost us anything to be flexible. One contract is on the basis of the Government purchasing all of the sulphate and toluol for two years after the completion of the plant.

Mr. BORLAND. That is, on the basis of a fixed price?

Col. McROBERTS. Yes, sir; at a fixed price of $1.50 per gallon for toluol, and 12½ cents, I think it is, for sulphate of ammonia. That means that he builds his plant and expects through the sale of those two materials to the Government to amortize his plant down to something like the normal cost before the end of the war. The second is on the basis of the Government furnishing all of the money——

Mr. BORLAND (interposing). Before we leave the first form of contract, let me ask you this: Does that leave some other by-products in the hands of the owner?

Col. McROBERTS. Yes, sir; coke and gas.

Mr. BORLAND. He has the gas, which he can use for power.

Col. **McRoberts.** Yes, sir.

Mr. **Borland.** Does he get any benzol?

Col. **McRoberts.** Yes, sir; benzol, tar, and products of that character.

Mr. **Borland.** Are they not of some value?

Col **McRoberts.** Yes, sir; they have some value.

Mr. **Borland.** Do they form a substantial element in the production of the plant? In other words, are they valuable products?

Col. **McRoberts.** Yes, sir; they are as valuable in normal times as toluol and ammonia. I do not know about the quantities, but they are just as important an element.

Mr. **Borland.** So that, after he has amortized the value of his plant down to what it would be worth in normal times——

Col. **McRoberts** (interposing). The theory is that if we buy those products at those prices for two years, the plant will then stand on its own basis.

Mr. **Borland.** How many of those plants have we contracted with on that kind of basis? In that case the owner finances his own construction?

Col. **McRoberts.** Yes, sir; and obviously they are confined to the strong people. The United States Steel Co. is on that basis. I can not give you the number, but there are several hundred on that basis.

Mr. **Borland.** Are they chiefly those of the United Steel Corporation?

Col. **McRoberts.** The United States Steel Corporation is one. There are 84 of the Allenwood Steel Co., 40 of the Indianapolis Citizens' Gas Co., 300 of the Jones & Laughlin Co., and 282 of the United States Steel Corporation. We are taking all the toluol and ammonia from those ovens.

Then, on the second basis, the Government furnishes the money for the construction of the plant, the plant to be purchased by the contractor at its appraised value on the completion of the contract. It provides for the operation of the plant for a period of two years, or during the period of the war and six months thereafter. In that case we furnish the money for the building of the plant, and the operator agrees to operate the plant during the period of the war and for six months afterwards, and then to buy the plant at its appraised value after the war. This plant is operated for the Government's account. The gas and coke and other products are sold, and the ammonia and toluol are delivered to the Government. On that basis we have contracted with a company at Buffalo for 150; with the Eastern Steel Co., of Pittsburgh, Pa., for 70; with the Fairmont By-products Co., of Fairmont, W. Va., for 110; with the Imperial Coal Co., the Birmingham By-products Co., for 50 altogether; and I think with the Tin Plate Co. at Wervaco, W. Va., for 40. I say that we have made those contracts, but the contracts are not yet signed. We have made the negotiations.

Mr. **Borland.** Therefore, of course, you have not reached the point where you are operating any of them?

Col. **McRoberts.** No, sir; and we will not get any products from these ovens short of 9 or 10 months. That is the shortest possible time, and it will be over a year before we get much from some of them.

Mr. BORLAND. Why is that?

Col. McROBERTS. It takes a long time to build them.

It is a slow job and requires a great deal of labor. Besides, they are generally in congested labor sections, because they must be where coke and gas are required.

Then, on the third basis the Government furnishes a certain definite sum to be repaid in toluol and ammonia, the Government purchasing the toluol and ammonia for two years after the completion of the plant or during the period of the war and six months thereafter. In that case the Government furnishes the money that is supposed to cover the excess cost of the ovens and will get it back in toluol and ammonia. Those contracts are on the third basis.

Mr. BORLAND. That is, we are supposed to furnish the difference between the cost of a beehive oven and the cost of a by-products oven?

Col. McROBERTS. No, sir; it is the cost of the by-products even in normal times, or the difference in the cost between that of normal times and now.

Mr. BORLAND. At what did you fix the price. What did you find it to be in normal times, or what was the price that the contractor was willing to accept?

Col. McROBERTS. The contractor thought the normal price about $15,000, but we succeeded in getting him to think that it was between twenty and twenty-five thousand dollars.

Mr. BORLAND. Did you succeed in getting them to think that the cost was $25,000?

Col. McROBERTS. I think we did.

Mr. BORLAND. What are your figures on that?

Col. McROBERTS. I have not the figures here.

Mr. BORLAND. Did you figure that, also, on the basis of those other by-products that he will get during times of peace, to wit, the coal tar, dye stuffs, benzol, etc.?

Col. McROBERTS. No, sir. We have gone into this with a good deal of spirit apart from the necessity, because we feel that it is in the interest of national economy—that is to say, instead of having the waste of the beehive ovens, we thought that the Government could well afford to encourage the building of by-products ovens, apart from the necessities of the war. That is the theory on which we have been able to induce people to build them now wherever a by-products oven would be useful to them after the war. They will not build them unless that is the case.

Mr. BORLAND. In other words, the inducement that they have to build them now is the sale of toluol at a high price to the Government?

Col. McROBERTS. In fairness to the people who have done this, I do not think that in any case would they have built the plants on these terms but for the necessities of the Government. They did not want to build them at those prices from the commercial standpoint. I feel sure, and we appealed to them very strongly on the ground that the Government wanted this material. We asked them to anticipate what they ought to do anyway.

Mr. SLEMP. Then, does the Government obtain the right to retain these plants if it so desires?

Col. McRoberts. We keep them as long as we require them.

Mr. Slemp. That is, as long as the Government desires them, the Government can retain them.

Col. McRoberts. Yes, sir.

Mr. Slemp. But when the Government desires to return them, the contractors take them at their appraised value?

Col McRoberts. For instance, in the first clause, where we agree to take the toluol, we agree to do that for two years, regardless of whether the war ends or not. If the war ends in the meantime they will either sell it for the Government's account——

Mr. Slemp (interposing). If the Government should desire to retain the plants, or should adopt the policy of owning such plants, would the Government have the right to do so?

Col. McRoberts. No, sir; I do not think we have provided for that. We have not anticipated that the Government would want them.

Mr. Borland. For how many coke ovens have you already contracted to be turned into by-products coke ovens? What is the total number?

Col. McRoberts. One thousand five hundred and thirty-seven in addition to the existing plants or plants under construction, for which the contracts have not been completed but for which the negotiations have been completed.

Mr. Borland. What is the number of existing plants and of plants under construction now?

Col. McRoberts. I can not give that figure.

Mr. Borland. They were all aided by some form of contract with the Government, were they not?

Col. McRoberts. Not necessarily.

Mr. Borland. How many were not aided?

Col. McRoberts. I do not know of any outside of those I am speaking of that have Government contracts for a period of years.

Mr. Borland. You think that the 1,537 that you have in this list embrace practically all that have been aided by the Government?

Col. McRoberts. Yes, sir; the Government is taking the products from all of them.

Mr. Borland. We are taking the product of those that are already built, and will take the product of those in process of construction?

Col. McRoberts. Yes, sir.

Mr. Borland. They were built under the natural stimulus of selling toluol to the Government?

Col. McRoberts. Yes, sir; at a time when it cost must less to build them.

Mr. Borland. They will not have a market for that toluol abroad?

Col. McRoberts. There would be a market for it abroad if it was permitted to be exported.

Mr. Borland. Was any of it exported before we entered the war?

Col. McRoberts. Yes; to the allies.

Mr. Borland. I mean during the European War, but before we entered it.

Col. McRoberts. I do not know whether it was exported in the form of toluol or not. It was exported in the form of T. N. T. It may have been made into T. N. T. before it was exported. I think there was a considerable export of toluol both to France and England before we entered the war.

Mr. BORLAND. Have you figured to any extent upon our requirements in the way of toluol?

Col. MCROBERTS. Yes, sir.

Mr. BORLAND. Have you in sight anything approaching those requirements?

Col. MCROBERTS. We have it all in sight or on paper. In addition to those toluol plants, we have a long list of gas-scrubbing plants—that is, where the gas plants have a volume of business that would warrant it. I think we take as our standard a plant that would produce down to 40,000 gallons of toluol a year. To give you an idea of the comparison, the New York City gas plants will produce about three and a half million gallons. We have built at Government expense plants for stripping toluol from the gas, and that is a large source of supply.

Mr. BORLAND. How small do those cities run?

Col. ROBERTS. Well, to comparatively small cities.

Mr. BORLAND. Would they be small cities like Frederick, Md., with 15,000 or 20,000 people?

Col. MCROBERTS. I think it would be more than that. I think it would have to be a city of about from forty to fifty thousand people. We have some gas plants in small places. We have installed only a part of the process in the smallest places, the stripping results there to be combined with those from other plants not yet installed but now under consideration.

Mr. BORLAND. What is your arrangement for installing that stripping process?

Col. MCROBERTS. The arrangement is that the Government pays the total cost of installing the plants, and they remain the property of the Government located on the property of the gas companies. The gas company operates it at cost for the Government's account. The gas company gets nothing, however, for the material or operation. I mean that they get nothing in the way of profit.

Mr. BORLAND. The gas company does not get anything?

Col. MCROBERTS. It is a little hard to understand that, but it comes out in this way: If the gas company should charge for the toluol, immediately the public would object because the stripping of the toluol from the gas reduces the British thermal units in the gas. Now, the gas companies were patriotically inclined, and many of them really did everything they could to help out in the situation. If they had not done so, it would have been a choice of whether they would do that or meet the clamor from the public for a reduction in the price of gas.

Mr. BORLAND. The Government installs its own plants?

Col. MCROBERTS. Yes, sir.

Mr. BORLAND. What does that cost? The Government is getting this toluol for the cost of installing the plants and operating them.

Col. MCROBERTS. Yes, sir.

Mr. BORLAND. Have you ever figured out how much that amounts to per gallon?

Col. MCROBERTS. It runs very high, of course, when you take the small plants. In the case of a small plant, it would run to $3.50 per gallon, or a little in excess of that, but it would average probably not more than $1.50 per gallon. That is the price that we have fixed as the standard price, but at one time it looked like getting toluol was a hopeless situation, and we paid high prices so as to bring out every possible gallon of it. In normal times, I suppose it is fair to assume that it would not cost more than 25 cents per gallon.

Mr. BORLAND. There would be no great demand for it then?

Col. McROBERTS. No, sir.

Mr. BORLAND. How generally have you installed those plants? Are they in all of the principal cities?

Col. McROBERTS. In nearly every one, and we have even canvassed South America.

Mr. BORLAND. That is, in every place where manufactured gas is used?

Col. McROBERTS. Yes, sir.

Mr. BORLAND. Is any of it obtained from natural gas?

Col. McROBERTS. We can not get it out of natural gas. Now, that left us about 10,000,000 gallons behind, or that much short of what we ought to have. Then we went into the by-products ovens, and those by-products ovens will produce pretty close to 4,000,000 gallons.

Mr. BORLAND. Do you mean those now operating?

Col. McROBERTS. No, sir; those under contract. Then a man out in California wired that he had found a new way of getting toluol from certain oils. We sent engineers out there, and they made a thorough investigation and built a small plant. In that investigation we employed not only experts from the Ordnance Department, but from the United Gas Improvement Co., of Philadelphia, and they approved the process. We are now building a plant out there costing $2,000,000. It is a Government plant, and under the arrangement made the inventor contributes his patents to the Government during the war and offers to assist in any other plants we may build. The plant will cost $2,000,000 and will have a capacity of 2,000,000 gallons a year. The conditions are such that we can operate that plant for two years and get toluol for a little less than $1.80 per gallon, or about $1.80 per gallon operating it for one year. After that is in operation, the toluol will be obtained much cheaper there than in any other way.

Mr. BORLAND. On the basis of operating one year, the cost will be $1.80 per gallon?

Col. McROBERTS. Yes, sir; or less than $2 per gallon. The cost will be somewhere between $1.50 and $2 per gallon.

Mr. BORLAND. That is counting the labor, material, and everything else?

Col. McROBERTS. Yes, sir; and we charge off the plant the first year. We are building that one plant, and we are just concluding a contract with the Standard Oil Co. to build another plant with a capacity of 3,000,000 gallons per year, and we expect to put a third one somewhere on the Gulf.

Mr. BORLAND. Is that process applicable only to California and Gulf oil?

Col. McROBERTS. Those are the only two places where we have found oil of the right quality.

Mr. BORLAND. That oil has an asphalt base, has it not?

Col. McRoberts. It is a 38° gravity Baumé distillate. It is coal-oil stock.

Mr. Borland. There is no demand for the coal oil?

Col. McRoberts. There is a demand for oil, but not for coal oil. We pay them 5 cents per gallon for the 38° distillate, and, taking that as the basis, it will fluctuate up and down as crude oil fluctuates. It is turned in at the stills and we get toluol and other products from this operation. Then they sell the residuum, which is a little bit of benzol, but mostly gasoline and fuel oil. They sell that for the Government's account, under certain restrictions, they guaranteeing all the accounts and guaranteeing the price to be not less than the average price obtained for their own oil during the same period.

Mr. Borland. Is that process applicable only to that class of oils, or can you crack the Oklahoma and Kansas oils in the same way?

Col. McRoberts. We are experimenting with them, but we do not get the same results.

Mr. Borland. The Oklahoma and Kansas oil, like the Pennsylvania oil, has a paraffin base.

Col. McRoberts. Some of it has an asphalt base.

Mr. Borland. Oil with a paraffin base is supposed to be of a higher grade than oil with an asphalt base.

Col. McRoberts. Yes, sir; it is a higher-gravity oil.

Mr. Borland. But this process is not applicable to it?

Col. McRoberts. I do not know whether it is due to the difference between this oil and oil with a paraffin base, or not, but it is a question of getting oil of a certain quality.

Mr. Borland. A few years ago the principal product from the distillation of oil was water-white coal oil, and the principal demand was for that, but now the principal demand is for gasoline, and there is an accumulation of coal oil in excess of the demand.

Col. McRoberts. We thought for a while, but we did not persist long in the opinion, that the reason why we could not make this process work in the mid-continent field was because they were using this same oil for making casing-head gasoline and were getting much more out of it than we were willing to pay.

Tuesday, May 28, 1918.

PROCUREMENT OF ORDNANCE MATÉRIEL.

(See pp. 318, 323.)

Mr. Borland. Colonel, when we closed last night you were discussing plans for providing a supply of toluol. Did you finish your statement on that?

Col. McRoberts. Yes; I think there is nothing further to be said. We were discussing the establishment of the two plants in California and our plans for a plant on the Gulf, dependent somewhat on our experiments with Gulf oil.

Mr. Borland. In the present estimates there is included an item of $52,000,000 for producing toluol, which is thus divided: $40,000,000 to equip 1,000 by-product coke ovens; $2,000,000 for scrubbing gas, and $10,000,000 for cracking petroleum. Under the system that has been followed in preparing for the war as early as possible some of those expenditures have been entered upon and even before they were estimated for. That makes it a little bit difficult for us to go into them.

Col. **McRoberts.** I can not explain that, because that would have to be explained by the Finance Division.

Mr. **Borland.** As I understand, you have entered upon the expenditure of that $40,000,000.

Col. **McRoberts.** On by-product coke ovens, yes. All of those contracts are practically in abeyance—I mean they are negotiated and awaiting signature, not all of them entirely, but most of them. The contract for the California toluol plant is signed and the plant is in process of construction; we have advanced considerable of the money, so that it must have been gotten from somewhere. That is the General Petroleum Co.'s plant; and then the contract with the Standard Oil Co. for its plant is ready for signature to-day.

Mr. **Borland.** You have pretty largely entered upon the expenditure of $6,000,000 for scrubbing gas, have you not?

Col. **McRoberts.** Yes; I think that those contracts are practically all completed, and appropriations made.

Mr. **Borland.** Did you have any other plants that you wanted to refer to in your list?

Col. **McRoberts.** There are other special plants.

Mr. **Borland.** What are they?

Col. **McRoberts.** There are, for instance, loading plants, which might be divided into two classes, bag-loading plants and shell-loading plants. The bag-loading plants are at Tulleytown, Pa., and the estimated cost of that plant is $5,000,000, and its daily capacity is 20,000 charges; there is a plant at Woodbury, N. J., near Camden, with the same capacity and the same estimated cost, and there is one near Richmond, Va. These are plants where the powder is put into silk bags and made up into charges.

Mr. **Borland.** That makes three bag-loading plants?

Col. **McRoberts.** Yes, sir.

Mr. **Borland.** How much did you say the aggregate investment in those plants is?

Col. **McRoberts.** They are estimated to cost $15,000,000.

Mr. **Borland.** I have a memorandum as to those plants, but the aggregate cost for the three seems to be only $10,000,000.

Col. **McRoberts.** I think they will easily cost $5,000,000 each.

Mr. **Borland.** What is there very expensive about a bag-loading plant?

Col. **McRoberts.** Well, there is nothing very expensive except their size. For instance, at Richmond, I think, we purchased 1,740 acres for the site. It is a collection of small units sufficiently divided so as to avoid the possibilities of fire, chiefly, and explosions to a certain extent, although smokeless powder is not a dangerous explosive, I mean, to handle. Then there are the transportation facilities and the facilities for carrying on the work, which means many structures and storage. Storage is one of the important items.

Mr. **Borland.** What class of buildings do you put up?

Col. **McRoberts.** They are temporary.

Mr. **Borland.** Corrugated iron, or something of that kind?

Col. McRoberts. I do not know the character of the structures, but it would probably be corrugated iron or light wood.

Mr. Borland. You do not put in much machinery?

Col. McRoberts. There is a good deal of machinery; yes. The design of the plant is approved by the engineering bureau and by the production division.

Mr. Borland. $5,000,000 apiece for bag-loading plants would seem to be a high figure.

Col. McRoberts. Yes; but it is a very big business. They will employ a very large number of people.

Mr. Borland. How many?

Col. McRoberts. I am a little bit timid about stating the number, but I know it is a very large number of people. There will be about 10,000 people employed in these plants.

Mr. Borland. I suppose they are all cheap hands, are they not?

Col. McRoberts. Yes; I should say that a great many girls are employed.

Mr. Borland. It would seem that there would not be very much machinery. You also have two plants for filling projectiles?

Col. McRoberts. We have more than that.

Mr. Borland. You are estimating for two additional plants for filling projectiles, making four in all?

Col. McRoberts. There are three in New Jersey. I have not the list here. There are three nearing completion and the fourth is the trench warfare loading plant.

Mr. Borland. You have entered upon the construction of two of those plants?

Col. McRoberts. Three of them.

Mr. Borland. Where are the three that have been started?

Col. McRoberts. They are all in New Jersey.

Mr. Borland. You have a gas generating and gas filling plant?

Col. McRoberts. The gas filling plant is a part of the Edgewood Arsenal on Powder River.

Mr. Borland. You have entered upon that?

Col. McRoberts. Yes; and, in fact, they are filling some shells there now; it is pretty well toward completion.

Mr. Borland. You are just about entering upon the construction of nitrate plants 3 and 4.

Col. McRoberts. The contract is now nearing completion for 3 and 4. We worked on it last night.

Mr. Borland. You are also providing some additional processes for nitrate plant No. 1; that is, you intend to put in the arc process there, do you not?

Col. McRoberts. No; I think not, because I think at No. 1 they contemplate using the Haber process.

Mr. Borland. That is the one at Sheffield?

Col. McRoberts. Well, if that is so it has not been discussed; but I should say not, though.

Mr. Borland. Why not?

Col. McRoberts. Unless the Haber process is a failure, and it is not a place where they can get sufficient power for the arc process, unless they use it simply to supplant the Haber process plant that is now being built as the result of it having failed. I can see no reason for the arc process there, because the whose basis of the arc process is power. There is a way by which you can utilize the arc process, if you want to go that far ahead, and that is by going up on the Saginaw River in Canada, and utilizing the tremendous power to be found there. Then the arc process would become entirely practicable.

Mr. BORLAND. It takes tremendous power to carry on the arc process successfully?

Col. McROBERTS. Yes, sir; it is expensive, and, commercially, it could not be developed unless you get your power as low as $10 per horsepower.

Mr. BORLAND. How much power would you need?

Col. McROBERTS. Well, it would depend on the size of your plant; but, to be effective, it would require upward of 100,000 horsepower.

Mr. BORLAND. They are developing water power at Muscle Shoals. Is that for this arc-process plant?

Col. McROBERTS. I am not familiar with that water-power development and I did not know they were developing it there. It was located there with the idea that it was on a site that could be developed into water power, and the Government owns that site.

Mr. BORLAND. Do you know anything about the character of the water power at Muscle Shoals? Have you given it personal investigation?

Col. McROBERTS. No; I have not.

Mr. BORLAND. You do not know whether it would be adequate for an arc-process plant or not?

Col. McROBERTS. I do not; but it might be sufficient to a limited extent.

Mr. BORLAND. But you do not know how much power they have there?

Col. McROBERTS. No.

Mr. BORLAND. Or how much it will cost to develop it?

Col. McROBERTS. No. that location was settled before I came to the department.

Mr. BORLAND. You say that was settled before you came here?

Col. McROBERTS. Yes; the location was settled.

Mr. BORLAND. When did you come?

Col. McROBERTS. In November, 1917.

Mr. BORLAND. The first expenditure was made November 16?

Col. McROBERTS. I came November 28, but the location of the plant was decided before that.

Mr. BORLAND. Do you know by whom it was decided?

Col. McROBERTS. I suppose it was decided by the nitrate division, and I am quite sure it was a matter of very general discussion with the War Industries Board and the other bureaus in interest.

Mr. BORLAND. It was not submitted to you?

Col. McROBERTS. No.

Mr. BORLAND. Your opinion was not asked?

Col. McROBERTS. No; because the matter was settled before I came here. However, I was consulted as to the terms of the contract.

Mr. BYRNS. As a matter of fact, the Secretary of War, the Secretary of Agriculture, and the Secretary of the Interior, I think it was, paid a visit to Muscle Shoals and other sites that were proposed for the nitrate plant.

Col. McRoberts. That was my information.

Mr. Byrns. They made their visit some time during the summer or early fall, and it was located after that; but by whom I do not know, although, of course, under their supervision.

Mr. Borland. You do not know anything about any additional process that is being put in at plant No. 1, which would involve an arc plant?

Col. McRoberts. No, sir. I told you yesterday that I have never had anything to do with plant No. 1.

Mr. Borland. Why is it that these things are not corelated under you? How is it there happens to be this piecemeal jurisdiction?

Col. McRoberts. Because the plant was contracted for and established before I had any authority over the contracting. I did not have any authority over the contracting of the department until about the last part of December; in fact, I think it was January 1 when the reorganization took effect.

Mr. Borland. When you did take charge the natural and necessary thing for you to do would be to take account of stock and an inventory of what you had on hand to work with and what you were going to do?

Col. McRoberts. A great many things that it would occur to you as natural to do it was impossible to do. We were crowded with an enormous amount of business to be done with the least possible delay and it was not a time to look back very much, and we have had very little time to look back and take stock of what took place before we came there.

Mr. Borland. I realize that, but if you are called into a task after it has been begun, you would want to know how much has been begun and how much you can build on the foundation that has been laid.

Col. McRoberts. As far as plant No. 1 is concerned, I did look into it to this extent, to know that it was an experimental process, not in the process, but in the method of carrying out the process, and I decided that the safe course was to ignore it.

Mr. Borland. As far as a producing agency for yor immediate needs the safe course was to ignore it?

Col. McRoberts. Yes, sir.

Mr. Borland. And consider it as an experimental process?

Col. McRoberts. Yes, sir; because military necessity does not wait for experiments, and after arriving at that conclusion I paid no further attention to it?

Mr. Borland. So you went ahead with your plans to get nitrates without regard to the experimental work being carried on at plant No. 1?

Col. McRoberts. Yes.

Mr. Borland. Have you any other plants, or does that cover them all?

Col. McRoberts. You mentioned a loading plant at Edgewood, Md.

Mr. Borland. There is another plant at Saltville, Va. Does that come under your jurisdiction? That is a plant being erected by the Bureau of Mines.

Col. McRoberts. No; that has never been in our department. The nitrate division has something to do with it, and the Bureau of

Mines. It is a contract that was entered into before I came there, and I have only general information regarding it.

Mr. BORLAND. That is to enable the Bureau of Mines to work out some process.

Col. McROBERTS. They are making sodium cyanide, I believe.

Mr. BORLAND. You are providing 1,000 acid tank cars. Do they come under your jurisdiction?

Col. McROBERTS. Yes, sir.

Mr. BORLAND. Have you entered upon that work?

Col. McROBERTS. I do not know how many tank cars we have, but we have a large number in service. They are necessary in supplying raw materials, where it is incumbent upon the Government to supply them.

Mr. BORLAND. Are the 1,000 tank cars estimated for here additional tank cars?

Col. McROBERTS. Undoubtedly, because we will have to have a large addition, especially for moving toluol. I think you will find those cars are equipped with heating appliances, and we have in mind the moving of toluol. I do not believe the chlorine plants have been touched upon. We are building a chlorine plant at Edgewood.

Mr. BORLAND. That is a part of the Edgewood development.

Col. McROBERTS. Yes. That plant is to have a capacity of 100 tons a day, and we estimate the plant to cost $6,000,000.

Mr. BORLAND. That is all embraced in this $30,000,000?

Col. McROBERTS. Yes. Then we have a small plant at Charleston, W. Va., and one at Philadelphia, with a capacity of 10 tons for the Charleston plant and 8 tons for the Philadelphia plant.

Mr. BORLAND. Are they chlorine plants?

Col. McROBERTS. Yes, sir.

Mr. BORLAND. Have you entered upon the construction of them?

Col. McROBERTS. Yes, sir. The one at Philadelphia, and the Charleston plant is under construction. The Edgewood plant is also under construction. I do not recall anything further in the way of special plants besides those related to you yesterday.

Mr. BORLAND. Which of these are Government owned and operated plants straight out and which of them are Government owned and operated under some other arrangement?

Col. McROBERTS. Except the chlorine plant at Philadelphia, they are all Government-owned plants, in all cases built and operated by contractors, in some cases as agents of the Government and in others as independent contractors.

Mr. BORLAND. Let us take them right on down. The Nashville Powder Plant is owned by the Government and operated by the Du Pont people.

Col. McROBERTS. By the Du Pont Engineering Co.

Mr. BORLAND. Under a contract by which they get so much a pound for the powder produced.

Col. McROBERTS. They build and operate the plant for an average period of six months. It is in nine units. From the time the first unit comes into operation they operate the plant over 54 unit months: in other words, the first unit coming in will be operated 18 months and the last one only one month, but it makes an average operation of six months for the plant. They build the plant and operate it during that period, which would cover the period of organizing staff and getting the operating organization in hand, for a fee of 3½ cents per pound and one-half of what they can save over the base cost of 44½ cents. That base cost is also determined or affected by the price of certain raw materials. In other words, 44½ cents as the base is modified up or down as those raw materials go up or down.

Mr. Borland. You are assuming that it ought to cost 44½ cents if the raw materials remain at a certain price?

Col. McRoberts. Yes, sir.

Mr. Borland. And the price ought to be modified up or down just as the price of the raw materials is modified up or down?

Col. McRoberts. Yes, sir.

Mr. Borland. The 3½ cents per pound is paid the Du Pont people on the output?

Col. McRoberts. That is guaranteed, and then they get one-half of what they save below the base cost.

Mr. Borland. Before that they were to build the plant or supervise the building of it?

Col. McRoberts. They designed it and built it, and they are reimbursed for all their out-of-pocket expense.

Mr. Borland. They put into it their expert knowledge?

Col. McRoberts. Yes, sir; and their organization.

Mr. Borland. And then they are to operate it on this basis for how long?

Col. McRoberts. For six months. I mean that six months is the average period of operation. The plant will come into operation one unit at the time. There are nine units, and the average operation of the nine units will be six months for the entire plant.

Mr. Borland. And at the end of six months——

Col. McRoberts (interposing). Then we make a new deal. We may either take over the operation of it and operate it as a Government plant or make a further extension of our arrangements with them.

Mr. Borland. Meanwhile, during the operation of it, during that period of six months, the Government pays, of course, for the raw materials and pays the labor roll?

Col. McRoberts. Yes, sir.

Mr. Borland. And for the upkeep of the plant?

Col. McRoberts. Yes, sir.

Mr. Borland. Do the Du Pont people contribute anything except expert management? Do they contribute any force?

Col. McRoberts. They contribute the entire organization that they get together, both the constructing organization and the operating organization.

Mr. Borland. But the operating organization is paid by the Government when gotten together?

Col. McRoberts. Yes, sir.

Mr. Borland. Do they contribute any of their officers?

Col. McRoberts. No, sir.

Mr. Borland. They do not contribute officers——

Col. McRoberts (interposing). All of their principal force will be engaged on it, but they will be paid in proportion to the time that they spend on it. It is a very great task.

Mr. **Borland.** The entire pay roll is met by the Government?

Col. **McRoberts.** Yes, sir.

Mr. **Borland.** There are no officers of the Du Pont people who conribute their time for a part of this compensation of 3½ cents?

Col. **McRoberts.** No, sir.

Mr. **Good.** What were the considerations that entered into the locaion of those various Government plants?

Col. **McRoberts.** First, upon the idea that a powder plant could be operated more effectively in the South or in a warmer climate. That affected somewhat the general location. Then, it must be ocated at a point where labor conditions are favorable and where housing conditions and transportation are favorable. The building of this plant requires from 20 to 30 and even as high as 40 carloads of material per day moving into the construction, and, obviously, you must get away from congested lines of traffic. Then, the particular location is determined by having a large site, level and adapted for building a plant. It requires a very large tract of land, and then, particularly, a water supply both for the use of the plant and for its disposal afterwards. This plant will use more water than the city of Boston per day. It will use materially more. While the water is neutralized from acids, etc., as it goes out of the plant, the question of how completely that is done is determined by the volume of water into which it is discharged. If it is discharged into a small stream, it would be almost impossible to neutralize it to the point where it would not become an offense and, probably, a menace to health. It would be a menace to fish in streams and to live stock along the streams. If it is discharged into a large river, that becomes less a problem.

Mr. **Borland.** What are the contract terms upon which the Charleston plants are built and operated?

Col. **McRoberts.** The Charleston plant, which is now under construction, is not constructed under the Ordnance Department, but by a special arrangement made by the Secretary of War its construction was placed directly with Mr. Jacklin, who is especially commissioned to build this plant. It has been constructed under his management. We have contracted for the operation of it by the Hercules Powder Co.

Mr. **Slemp.** Does the Ordnance Department try to develop any managerial talent, so to speak, to take charge of the Government plants and operate them so as to make them purely governmental propositions, and in that way avoid heavy overhead charges like that cost of 3½ cents per pound?

Col. **McRoberts.** No, sir; but we have at times been forced into things of that sort. But we have not had the time or personnel to pursue it as a policy.

Mr. **Slemp.** Would the Ordnance Department be prepared at the end of this average period of six months to take over the powder plants, or are you anticipating what might happen then, and are you preparing a force that will be able to take charge of the plants and save money to the Government?

Col. **McRoberts.** In the first place, there will be, of course, a large operating organization there running these plants.

Mr. **Slemp.** Yes; but it will be the Du Pont Powder Co.'s organization.

Col. McRoberts. I do not quite see how they could move such a large organization very readily, unless they should have another big plant coming into operation. Unless they had another big plant coming into operation, they would not have any use for them.

Mr. Slemp. I asked the question for the purpose of rather suggesting the matter to you, because there are so many of these Government plants, not only powder plants, but other plants, and I think it would be well to take that phase of the matter into consideration.

Col. McRoberts. It is not practicable for the Ordnance Department to undertake to operate all of those plants, for the simple reason that it is impossible to get the men in the Ordnance Department with sufficient training and experience to do it on a large scale. We have a large organization in the Ordnance Department capable of doing those things in an emergency, but they also have so much demand upon them for other things that we do not want to assume that burden if it is possible to avoid it. We have sufficient talent and experience in the manufacture of powder in the Ordnance Department to take over and direct the plant——

Mr. Slemp (interposing). So that you are not entirely at the mercy of the people who have been manufacturing powder?

Col. McRoberts. No, sir; we are not entirely at their mercy. We might take over this plant at the end of six months and operate it. I am satisfied of that. Whether we would, or not, would, of course, depend upon the circumstances at the time.

Mr. Borland. Is Mr. Jacklin's connection with the War Department confined to the construction of this plant?

Col. McRoberts. So far as I know, yes, sir.

Mr. Borland. And he is practically contributing his time and services, is he not?

Col. McRoberts. Yes, sir; I believe so.

Mr. Borland. Then, when the plant is finished it is to be operated by the Hercules Powder Co.?

Col. McRoberts. Yes, sir; we have a contract with them for doing it, and that contract is much along the same line as the contract with the Du Pont Co., except that the basis of their compensation is 2¼ cents per pound, instead of 3½ cents, they not having had the burden of building the plant.

Mr. Borland. How long is that contract to run?

Col. McRoberts. For six months.

Mr. Borland. And then the Government is entitled to make a new contract or take over the management of the plant?

Col. McRoberts. Yes, sir.

Mr. Borland. So that the profits that the Hercules people get out of it is gotten out in the first six months?

Col. McRoberts. Yes, sir. It is not six months, because it will take them longer to do that, because, as I explained, it is based on the units. The Charleston plant is a six-unit plant. If you will figure it out, you will see that it will run considerably over a year.

Mr. Borland. As I understand it, the advantage of that arrangement is that it enlists the Hercules Powder Co. in the organizing of a force?

Col. McRoberts. Yes, sir.

Mr. Borland. Which is a rather difficult matter in a powder plant?

Col. McRoberts. Yes, sir; it is very difficult.

Mr. Borland. And this favorable contract was made with them to enable them to organize the force and put it in operation?

Col. McRoberts. Yes, sir.

Mr. Borland. And when we get that advantage, the Government will be in a position at the end of six months of operation to deal with them on terms that appear to be fair and right at that time?

Col. McRoberts. Yes, sir.

Mr. Borland. Now, about these new powder plants: There are two new ones—or it turns out that way—for which you have estimated here altogether $45,000,000. Have you made any arrangements at all looking to the construction and operation of those proposed new plants?

Col. McRoberts. I did not know that they had any new plants in these estimates.

Mr. Borland. They have, but they frankly stated that that depended upon some further requests from Gen. Pershing.

Col. McRoberts. Of course, we all have our views, and there is a little difference of opinion about the necessity for those plants. We have the locations for them in mind, but they are not acquired.

Mr. Borland. I was not asking especially about the location of them. Have you any plans in mind for the construction and operation of them in case the committee authorizes them?

Col. McRoberts. Yes, sir; definitely so. I think we will do it just as we have done in the case of the Nashville plant.

Mr. Borland. Will you be able to get an operating force?

Col. McRoberts. Yes, sir; in the same way. I think we would make a contract with the Du Pont people for operating that plant.

Mr. Byrns. Do I understand that there are two new plants contemplated?

Mr. Borland. Yes; they have estimated $45,000,000. They first estimated $15,000,000 for an additional plant and $30,000,000 in a supplemental estimate for an additional powder plant. Gen. Dickson stated that that meant two plants.

Col. McRoberts. I think it would be one plant. If we build at all, it will be one plant with a capacity of probably one-half that of the Nashville plant. If we go beyond that, it will be an extension to the Du Pont plant.

Mr. Byrns. According to my recollection of the statement of Gen. Dickson, they contemplated one new plant, and then extending other plants already in existence.

Col. McRoberts. That is my recollection of it, and I think that is the practical way to handle it.

Mr. Borland. We will take up this No. 2 nitrate plant: First, I believe you stated that No. 1 nitrate plant was not under your jurisdiction?

Col. McRoberts. Yes; sir.

Mr. Borland. What is the arrangement for the operation of No. 2 nitrate plant?

Col. McRoberts. That is a rather complicated thing to explain although the contract is simple enough. This plant is built and operated by a corporation called the Air Nitrates Co., which is a purely engineering company.

Mr. Borland. Who are the chief figures in that cómpany?

Col. McRoberts. The American Cyanamid Co. They own a plant at Niagara Falls. They have brought out and perfected in this country the operation of this air-fixation process, and they were the only ones in the country that knew definitely and by experience how to make ammonium nitrate by this process. We had to go to them. That was the only practical way of getting the stuff. It presented a great many difficulties. They had spent a large part of the period of their patents in experimental work with this thing, without any particular profit to themselves, and had arrived at a point where it was profitable, because of the additional improvements, patents, etc., in connection with the process, and the experience that they had gained. They were confronted by the fact that if the Government built a plant they would have to contribute this knowledge and experience. Then, the Government could create a large plant in this country which could be operated by the Government practically on any terms that the Government wished to dictate as to their patents, because the Government could take their patent rights and utilize them, and throw them into the Court of Claims, which would mean a problematical return. For that reason they were quite loath to undertake it. They felt that they could not afford it.

Patriotic appeals were made, and that, among other things, led them to take it up. We finally concluded a contract with them by which they built a plant for a construction fee of, I think, 3½ per cent of the cost, which was limited to $1,000,000, and they are to operate the plant for a fee of one-fourth of a cent per pound for superintendence, and one-fourth of a cent per pound for royalties on the patents. That is to run during the life of the contract, and the contract is to run as long as the output of the plant is required for military uses. Those are the terms upon which this plant is being constructed. Now, we are just completing a contract covering two additional plants and reforming the first contract. It looks now as if we would substitute for the first contract a contract covering construction of the three plants, under which the construction fee of the three plants will be limited to $1,500,000. The fee for operation and for the patents combined is one and one-half times that in the first contract. In other words, for increasing the output, or doubling the output, they will reduce their rate of compensation one-third. I believe those are correct fractions. The patent arrangement is modified so that they agree that the Government shall have the right to use the patents after the expiration of the contracts, either for the operation of plants or for the operation of plants by purchasers upon terms to be agreed upon by arbitration. The royalties are to be fixed by arbitration. That cures a serious defect in the arrangement, because we would spend a large amount on the plant without the right to operate it after the war, and it also puts the patentee in a position where he will be a little more comfortable as to what will be done about the patents after the war.

Mr. Slemp. With what plants have you entered into contracts under which the parties with whom you have contracted have agreed to construct the plants and operate the plants for a certain time without cost to the Government?

Col. McRoberts. Well, there is a big gun plant——

Mr. SLEMP (interposing). That is the United States Steel Corporation plant, is it not?

Col. MCROBERTS. Yes, sir; that is the United States Steel Corporation.

Mr. SLEMP. Is there any other plant where that character of consideration has been given to the Government?

Col. MCROBERTS. No, sir; that is the last contract made, and we have not gotten anybody else to do that.

Mr. SLEMP. Do you think that will be a sort of worthy precedent to be followed?

Col. MCROBERTS. I do not see how we could improve on that very much. That is what we have been progressing toward.

Mr. SLEMP. You have accomplished that much, and I thought you ought to be congratulated on that.

Col. MCROBERTS. We will not neglect any opportunity to use that as an exhibit when we want to build other plants.

Mr. Chairman, you asked yesterday about the Symington plant. The Symington plant was only engaged in shell making for the Russian Government before we entered the war. The aid we have extended to that plant is for the creation of a high-explosive 75-millimeter shell plant, into which we will put about $3,500,000. It is a Government plant. We did not advance the money, but it is covered in the price. Then we advanced the money and built the gun plant. It is gun machining entirely. For that we have spent about $4,000,000. At the present time there is negotiation on for the creation of a new plant for 155-millimeter shell, which we have some difficulty in getting—that is, I mean in feeling that we have a sufficient reserve in sight—and the Symingtons have been asked to create that plant, not at Rochester, but somewhere in the Middle West. Such a plant will probabley cost five or six million dollars if that plan is carried out. That is the relationship with the Symington plant.

Mr. BORLAND. Do I understand the Government is to own those plants?

Col. MCROBERTS. Yes; they do own the plants.

Mr. BORLAND. And the Symington company operates them as our agent?

Col. MCROBERTS. No; they operate them as contractors for a fixed price per shell.

Mr. BORLAND. What allowance is made in the price by reason of the fact that we own the plant?

Maj. BAKER. We gave them an order for 2,000,000 for the shell plant and 4,000,000 for the forging plant. The forging plant will have a capacity of 60,000 a day and the shell plant a capacity of 40,000 a day and the shrapnel plant 25,000 a day.

Col. MCROBERTS. They built the plant under plans approved by us, and we added enough to the price of the shell to amortize that plant, and the Government owns the plant. In other words, they advanced the money for building the plant, and the ownership of the plant is in the Government.

Mr. BORLAND. How are they getting along with their forging? Have they begun to do any forging?

Maj. **Baker.** They are making 20,000 forgings a day at the present time, and by the 1st of July they will be turning out from 45,000 to 50,000.

Mr. **Borland.** Shells?

Maj. **Baker.** Forgings. They are already producing shrapnel at the rate of 20,000 to 25,000 a day. In the month of February they produced 575,000, and in the month of March they produced about 550,000. In the month of April they produced a little less than 600,000.

Mr. **Borland.** That is, all shrapnel?

Maj. **Baker.** Yes. Their capacity this month has been somewhat curtailed by reason of the fact that certain changes in the size of the shell have been made, but their shrapnel plant can be considered as a 25,000 per day plant; their high-explosive plant can be considered as a 40,000 per day plant.

.Mr. **Borland.** How are they getting along with the high-explosive shell?

Maj. **Baker.** They are just getting into production. They are making them at the rate of about 5,000 or 6,000 a day at the present time.

Mr. **Borland.** Are they attempting to make those according to the French specifications by the heat treatment?

Map. **Baker.** Yes, sir.

Mr. **Borland.** Have they succeeded in carrying out that treatment?

Maj. **Baker.** Yes, sir.

Mr. **Borland.** Do they make satisfactory shells?

Maj. **Baker.** Yes, sir.

Mr. **Borland.** How are they getting along with their gun forgings?

Maj. **Baker.** Col. Hughes can answer that.

Col. **Hughes.** They are not making gun forgings. They are doing the machining.

Mr. **Borland.** I thought I understood you to say they were making gun forgings.

Maj. **Baker.** I might distinguish between the two kinds of forgings. The one I spoke of is the one that makes the forgings for the shell. The other plant you had reference to is the one making forgings for the gun. They are entirely distinct.

Mr. **Borland.** Do they have any forging plants for making gun tubes?

Col. **McRoberts.** No; they get their forgings from the Buckeye Co.

Mr. **Good.** These are all 75-millimeter shells that you are speaking of now?

Col. **McRoberts.** Yes, sir.

Mr. **Borland.** In reference to the picric-acid plants, have you begun construction on those?

Col. **McRoberts.** Construction work is under way at Brunswick, Ga., and at Little Rock, but I do not believe the Semet-Solvay plant has begun, or is just about beginning.

Mr. **Borland.** What is your arrangement for operating those plants?

Col. **McRoberts.** I am sorry I have not the contracts here, because they are quite complicated. In the first place, in each case they build the plant without compensation for the construction.

The Government reserves the right to furnish the raw material. It is all material that is fixed by the Government and allotted by the Government, so that that is not a very important factor one way or the other. They have to get it through Government agency, being nitrate of soda or else nitric acid and phenol, principally. Although the three picric-acid plants are not built on exactly the same terms, the principles that are common are that in each case they operate at a fixed price, assuming a basis of cost for the raw materials. They get a fee for the operation and participate in the saving under a bogey price, which is limited not to exceed 4 cents a pound. I think it is limited to 4 cents. I am not quite certain, but I think in one case, under certain conditions, they could earn as much as 4 cents a pound. It is a close-margin business.

Mr. BORLAND. The gross earnings are limited, even under their agreement for a share of the savings?

Col. MCROBERTS. Yes, sir.

Mr. BORLAND. With whom is that contract made?

Col. MCROBERTS. One is made with E. M. Davis Chemical Corporation, for the plant to be located at Little Rock, Ark.; the Semet-Solvay Co., the site for which plant has not yet been definitely located; and the Butterworth-Judson Co., at Brunswick, Ga.

Mr. BORLAND. Who are these people? Are they people who have had some previous experience in the manufacture of this particular product?

Col. MCROBERTS. Yes, sir. The Semet-Solvay Co. and the Butterworth-Judson Co. are the largest manufacturers now of picric acid, or raw materials, phenol, etc. The E. M. Davis Chemical Corporation is a new organization formed for this purpose. It was organized by E. M. Davis, who originally brought out the Butterworth-Judson Co. and operated it. He is a man who has had long experience in picric acid, explosives, and chemical plants. He got together the organization for this business; he has had experience and is surrounded with experienced men.

Mr. BORLAND. What is the period of these contracts?

Col. MCROBERTS. They are given an order for a specific amount. The capacity for the Little Rock plant is three and a half million pounds per month, the plant at Knoxville, Tenn., 5,000,000 pounds, and the plant at Brunswick, Ga., 6,000,000 pounds. I do not recall how it is divided, but the total of the three is 175,000,000 pounds. In other words, the period of operation is determined by the order.

Mr. BORLAND. By producing that maximum amount?

Col. MCROBERTS. Yes, sir.

Mr. BORLAND. What arrangements are there, if any, about the operation or ownership of the plants after the termination of these orders?

Col. MCROBERTS. They are Government plants in each case. There is no arrangement for selling it. There is no agreement that is binding, but it is contemplated that the Brunswick, Ga., plant may be utilized as a fertilizer plant. There is no contractual disposition of the plants.

Mr. BORLAND. The Government hopes to dispose of them to these parties or some other private parties.

Col. MCROBERTS. Well, we will have them and probably have no use for them as picric-acid plants, so it is assumed we will find some other use for them.

Mr. **Good**. Is picric acid used for any industrial purpose?

Col. **McRoberts**. Only in a small way. It has very little commercial value, although, of course, it is a persistent dye. They say that is why they go south with these picric-acid plants, that the negroes do not object to becoming yellow.

Mr. **Good**. Is picric acid used in dyestuffs?

Col. **McRoberts**. I think it is, but, of course, that is a very small use for it compared to its use in explosives. It is used in chemicals for other purposes to some small extent.

Mr. **Good**. If we went into the production of dyestuffs and dyes in this country there would be quite a demand for picric acid?

Col. **McRoberts**. One of these plants would dye the whole country; it would turn everything yellow if you used it for that purpose.

Mr. **Borland**. You say you will have information later as to the bag-loading plants?

Col. **McRoberts**. No; they are the shell-loading plants, and I have the list here.

Mr. **Borland**. Are you able to give us the terms under which the bag-loading plants are operated?

Col. **McRoberts**. No; I do not recall the terms of the contracts for the bag-loading plants. That work is cost plus business, and you can not do it otherwise, because it varies according to the requirements of the loading. I mean the engineering bureau changes the size of the charges, and all that sort of thing, the calibers, etc., and it is a constantly changing operation.

Mr. **Borland**. How are they operated? Are they operated by private concerns?

Col. **McRoberts**. Yes; by contractors who supervise the building and who operate the plants.

Mr. **Borland**. The plants, however, built out of Government money?

Col. **McRoberts**. Yes, sir; and they are Government plants.

Mr. **Borland**. You are not able to give us the terms of these contracts?

Col. **McRoberts**. Not at this time; no.

Note.—The contract is a cost-plus contract, and the construction work is done in accordance with usual construction division contract. The net compensation of the contractor for creating quantity production of a highly technical nature—supervising construction and operating—will be equivalent to 14 per cent.

Mr. **Borland**. The chlorine plant is a Government plant?

Col. **McRoberts**. That is a Government plant built in this way: The construction division superintend the building, the work actually being undertaken by a contractor; in this case I think it is the Foundation Co. doing the work. It involves a power plant of considerable size. It was originally planned to build a larger power plant there, but we arranged to take power from the transmission line between McCalls Ferry and Baltimore, and to simply build an insurance unit, because it is important that in this particular chlorine plant there be no interruption. We are utilizing the chlorine as gas and not as a liquid, and it goes immediately to the gas plant; a shutdown of the plant means that this stuff must escape, or something disagreeable happens.

Mr. **Borland**. That is the plant at Edgewood?

Col. McRoberts. Yes, sir. So it is important that we have a dependable source of power. We are putting in a small power plant there of 20,000 kilowatts, 10,000 active and 10,000 reserve, and have tapped in on the McCalls Ferry line under a very favorable contract with the Baltimore Co. for the current. The Foundation Co. is constructing the buildings under terms approved by the construction division, which was formerly the cantonment division. Of the chlorine plant itself, the chlorine cell house is the technical thing and must be designed and installed and the cells manufactured by technical manufacturers. We made that contract with the Warner Chemical Co., located at some place in New England; I have forgotten where it is located. They furnish the cells for the plant at so much a cell, furnish all the engineering, and all the other things that are incident to the work; they install the cells and superintend the operation for a period of at least six months. That is all they are obligated to do.

Mr. Borland. What is the compensation?

Col. McRoberts. It is in the price of the cell. These cells sold in the market for between $250 and $300 a cell, and we bought them for $220, or around that price, and they contribute the engineering.

Mr. Good. In all of these plants that you have been describing I take it that the power plant is, by the very nature of things, a sort of permanent building?

Col. McRoberts. Yes.

Mr. Good. In the nitrate plants are they permanent buildings?

Col. McRoberts. Well, the Muscle Shoals plant is designed as a permanent plant, because the original appropriation for that was under a special act for the creation of a nitrate plant, and it is contemplated that that plant will be permanent, and the reason for locating it at Muscle Shoals was that there would be water power available for operating it. All of these other plants are temporary.

Mr. Good. Of what material are they constructed?

Col. McRoberts. Well, depending on the requirements, it is either light wood, corrugated iron, or something of that sort.

Mr. Good. Is that true of the chlorine plant?

Col. McRoberts. No; that is of light construction. Of course, the power house is of temporary construction, except that the foundations must be perfect. The chlorine plant itself—that is, the chlorine cell house—must be of tight construction, as far as the weather is concerned, for at least 10 feet, and no openings below that, for the purpose of protecting the cells; and, of course, there must be a good roof, but otherwise that is as cheap a building as we can build to meet those requirements.

Mr. Good. Is it of brick?

Col. McRoberts. No; of wood.

Mr. Good. How about a powder plant?

Col. McRoberts. The buildings of a powder plant are of light construction, just as light as we can make them.

Mr. Good. You use steel frames in most of the buildings?

Col. McRoberts. Yes; I think in the large buildings we have to use steel frames.

Mr. Good. What about your gas-loading plant?

Col. McRoberts. That is more or less permanent; we expect that to remain on the reservation for future use, if we ever have to use it.

Mr. Good. These plants are all constructed on ground that has been purchased by the Government?

Col. McRoberts. All of these independent plants; yes. There are some plants that are additions, but all of the independent Government plants are on Government land.

Mr. Borland. I suppose you are seeking to inject into these contracts an inducement to the contractor to lower his price to the Government by adding something to his compensation if he does lower it?

Col. McRoberts. We do that where there is a basis for doing it. In other words, if the cost of an article can be quite definitely determined, we hold out as an inducement to the contractor to reduce the cost a participation in the saving, but we must have a definite basis for the cost. Otherwise you might fix it too high and be presenting the contractor with a gift, or if you fix it too low the incentive for attempting to reduce the cost is lost.

Mr. Borland. You were talking about a chlorine plant. Have you finished with that statement?

Col. McRoberts. Yes, sir.

Mr. Borland. Now, the chlorine plant you were speaking of is located at Edgewood Arsenal, Havre de Grace, Md. Are there other chlorine plants?

Col. McRoberts. We have only two others—one at Philadelphia and one at Charleston.

Mr. Borland. How are they operated?

Col. McRoberts. The one at Edgewood Arsenal, which, of course, is the large one, and the only large one, is operated by the Government. That is desirable because we want the operation of that arsenal and gas-filling plant to be secret.

Mr. Borland. The gas-filling plant is also operated by the Government?

Col. McRoberts. Yes, sir; entirely.

Mr. Borland. How about the other chlorine plants? How are they operated?

Col. McRoberts. I would rather submit a statement of those contracts, because it is a little complicated. They involve their taking the plants when we are through.

Mr. Borland. Now, as to your shell-filling plants, of which you have four——

Col. McRoberts (interposing). I think I can give you an accurate description of them, but I can not give you the costs at this time. We have six of them altogether. There is the Atlantic Loading Co., at Hammonton, N. J., where the shells are loaded and assembled with the adapters, booster cases, and detonator fuses. Those materials are for high explosive shells. Then, there is the Bethlehem Loading Co., at Mays Landing, N. J., with supplemental plants at Redington, Pa., and New Castle, Del., for loading and assembling high explosive shells, adapters, booster cases, and detonator cases. Then, there is the Du Pont Engineering Co., at Penniman, Va., which is practically the same, handling high explosive shells.

The next is the T. A. Gillespie Loading Co., at South Amboy, N. J., for high explosive shells; the California Loading Co., at Gillespie, N. J., for detonator fuses and fuse cases; the Marlin-Rockwell Loading Co., of Delaware City, Del., for shells used in trench warfare, drop bombs, etc. All of those plants, as I recollect, without referring to the contracts, were built and operated by those various companies. They received a fee of 10 per cent for construction, or for designing and engineering construction. They receive 10 per cent of the cost of the operating in the initial stages of the operations, until the plants get up to 70 per cent of the total capacity. Seventy per cent of the estimated capacity is taken as the basis of cost, and they participate in the savings that can be made below that base cost to the extent of 25 per cent. The plant at Penniman, Va., built and operated by the Du Pont Engineering Co., is on a different basis. They built it without construction fees, and they operate it for a straight 14 per cent of the cost of operation.

Mr. **Borland**. You say that there are six of those plants that are built by Government money?

Col. **McRoberts**. Yes, sir.

Mr. **Borland**. My estimates here show only four. Does your record show how much is the investment in those plants?

Col. **McRoberts**. No, sir. I will get a record of that, however. I am quite sure that they are all built by Government money.

Mr. **Borland**. My record here shows that the original estimates were for two filling plants at $12,500,000, and in the supplemental estimates there are two more at the same figure, $12,500,000.

Col. **McRoberts**. They may have been built out of old appropriations. I think the Bethlehem plant and one other were built out of previous appropriations, and that would leave you the other four.

Mr. **Borland**. Then, in that case, my understanding is that they are coming in and asking appropriations at this time so they can reimburse some other fund.

Col. **McRoberts**. I do not know about that.

Mr. **Borland**. You have already described nitrate plants Nos. 3 and 4, they being under the General Chemical Co., and nitrate plant No. 1, you say, does not come under your jurisdiction?

Col. **McRoberts**. No, sir.

Mr. **Borland**. Now, as to the nitrate plant at Perryville, Pa.——

Col. **McRoberts**. That is an ammonium nitrate plant built by the Atlas Powder Co. I negotiated that contract, and it is a highly technical plant. That is something that has never been done before in this country. It is a very technical operation. It was worked out in England, and this is a copy of that, and they claim that it is probably an improvement on the English process. The Atlas Powder Co. has had people over there and the Ordnance Department has had people in England studying the matter, and this is the result of that study and investigation.

Mr. **Borland**. They expect to use this ammonium nitrate as a substitute for T. N. T.?

Col. **McRoberts**. They combine them to make amatol. As I have said, this plant was constructed by the Atlas Powder Co. To get the exact terms of the contract, I would have to refer to the contract itself, but as I recollect the terms of the contract the fee was 3½ per cent for construction and the operating fee was three-eighths of a cent per pound for the materials.

Mr. **Borland**. What is the output?

Col. McRoberts. The output is 18,000,000 pounds monthly.

Mr. Borland. And they get three-eighths cent per pound?

Col. McRoberts. As I said, I am giving that from memory; but I think that is true.

Mr. Borland. Of course, you can correct that in the record.

Col. McRoberts. Yes, sir; I will do so.

Mr. Borland. Do they participate in any saving?

Col. McRoberts. There is no basic price to be determined, because we have never manufactured it by this method before.

Mr. Borland. They get a fixed fee of three-eighths cent per pound and the Government pays the cost?

Col. McRoberts. Yes, sir. It is one of those cases where the organization, or an experienced organization, is absolutely essential to the operation.

Mr. Borland. My understanding is that this ammonium nitrate is going to be produced at somewhere along about 10 or 11 cents per pound. Is that right?

Col. McRoberts. I have not the figures, and I do not recall. I think I will have to change those figures I gave you. I think that 3½ cents per pound is not the case. I will have to furnish you a memorandum on that.

Mr. Borland. My recollection is that they expected to produce this ammonium nitrate at 10 or 11 cents per pound and that it would take the place of T. N. T.

Col. McRoberts. One-fourth of a cent is the fee, as I recollect it now.

Mr. Borland. It is to take the place of T. N. T., which costs 50 cents per pound.

Col. McRoberts. I will supply those figures. I am quite sure that it was 3½ per cent for the construction fee and three-eighths of a cent for operation; but I will verify that.

Mr. Borland. You have entered upon the construction of that plant?

Col. McRoberts. Yes, sir; it is on the way. We started it with half of its capacity, and now we are contemplating doubling it.

Mr. Borland. When do you expect to have it in operation?

Col. McRoberts. I do not know the progress of the work, but it was originally stated that they would begin to produce ammonium nitrate in July, or within five months.

Mr. Borland. I suppose there are no terms or conditions in that contract with reference to the disposal of the plant to the contractor?

Col. McRoberts. No, sir; there is no provision for that.

Mr. Borland. The plant at Saltsville, Va., is not under your jurisdiction?

Col. McRoberts. No, sir; that is under the Bureau of Mines.

Mr. Borland. That was constructed out of an allotment by the Ordnance Department to the Bureau of Mines?

Col. McRoberts. Yes, sir.

Mr. Borland. You have also described those two plants for cracking petroleum, and I think you put the terms of those contracts into the record?

Col. McRoberts. Yes, sir. I can give you a statement of that from memory.

Mr. Borland. All right; go ahead.

Col. **McRoberts.** The inventor of this process contributes his patents to the Government during the war, and he agrees to build the first plant with a capacity of 2,000,000 gallons of toluol per annum, at an estimated cost of $2,000,000, and he will operate it on these terms: He is to operate it for the Government's account; he is to furnish the plant its requirements in the way of raw material or oil—that is, 38 Baumé petroleum distillate—at 5 cents per gallon, fixed in relation to the present price of crude oil price. If crude oil goes up or down the price of 5 cents per gallon is modified accordingly. The Government gets all of the production of the plant. It takes the toluol or such other products as it may require, and the contractor sells the remainder for the Government's account. The basis for the sale is fixed by his guarantee to the Government to receive not less than what he receives for the same oil that he is selling from his own refinery. He guarantees all the accounts and receives 2½ per cent for the guarantee and 5 per cent commission for selling. He receives no other compensation.

Mr. **Borland.** That contract is made with the inventor?

Col. **McRoberts.** In addition, he gets a 10 per cent construction fee for the plant.

Mr. **Borland.** That contract is made direct with the inventor?

Col. **McRoberts.** Yes, sir.

Mr. **Borland.** Is there any limitation on the contract?

Col. **McRoberts.** It can be canceled at any time and the Government can own the plant.

Mr. **Borland.** It can be canceled and determined at an agreed sum?

Col. **McRoberts.** No, sir. He receives 10 per cent for construction, and we can cancel it at any time or we can stop the construction at any time.

Mr. **Borland.** Have you entered into any contract with the Standard Oil Co.?

Col. **McRoberts.** We are doing so. We are completing a contract with them to build a plant with a capacity of 3,000,000 gallons of toluol per annum, which is to be located also in southern California. That is to be done on substantially the same terms.

In reference to the percentage contracts, I would like to make a statement that on the shells we have 754 contracts, and there are only 6 on the cost-plus basis.

Mr. **Borland.** Well, that would be some indication after you gave us the amount of those six contracts.

Col. **McRoberts.** Well, I can do that.

Maj. **Baker.** The cost-plus contracts are with the Bartlett, Hayward Co., the American Can Co., and the Symington Co.; but the new contracts negotiated with each of them are on the fixed-price basis, using the figures that were established on the cost-plus contracts as the basis for negotiating the new contracts on a fixed price.

Col. **McRoberts.** And you have a contract with the American Brake Shoe & Foundry Co.?

Maj. **Baker.** Yes.

Col. **McRoberts.** And another one with the plant at Dayton, Ohio?

Maj. **Baker.** The Dayton, Ohio, Production Co.; yes, sir.

Mr. Good. How does the cost to the Government per shell compare in the cases where you have purchased the shells on the cost-plus basis with the prices where you purchase them at so much per shell!

Col. McRoberts. I do not believe we have arrived at the point where we can make a fair statement of that, because you can not tell the cost until the contracts have all run out and you have taken an inventory and found out just where you are. Is not that correct as to the shells, Major?

Maj. Baker. Yes; that is substantially correct.

Col. McRoberts. I know that is true in other business. Later on we can give you those figures; but we are not far enough along now.

Mr. Borland. Colonel, it is intended to build a T. N. T. plant. Has any work been begun on such a plant?

Col. McRoberts. You mean the design of the plant?

Mr. Borland. Yes.

Col. McRoberts. No; that would not be necessary. The plant is a simple thing to build. It is simply nitrating toluol. It is a great area of small units of pans, etc. It is not a difficult plant to design, and it is only difficult to operate because it requires first-class experience and a large organization.

Mr. Borland. You are asking $25,000,000 for that purpose. Does that mean one plant or more than one plant?

Col. McRoberts. Well, it could be divided, probably. Present plans—I do not mean, now, construction plans, but plans for placing it—contemplate a number of things. There are three people it could be divided up with. We ought to put one plant in California to take our production of toluol there and also to save our acid supply, which is in California. In other words, we ought to put enough capacity in California to consume the acid supply there. As it is to-day, there is an over-acid supply. We could divide it among several here. There are the Semet-Solvay Co., the Aetna Co., Grasselli Powder Co., Atlas Powder Co., and then, of course, there are the Du Pont Co. and the Hercules Powder Co. Those would be the people we would consider as having had experience in capacity in varying degree for making T. N. T.

Mr. Borland. How do you purpose to have those plants operated—the same way you are operating the nitrate plant?

Col. McRoberts. In this case we will probably be called on to consult with the War Industries Board, and it would, perhaps, be more or less subject to the approval of the Secretary of War, because it is such a large operation. There may be reasons that enter into it that would influence our opinion. My own judgment, if I were to be called on to express one, would be that we would get one of the large organizations to build one unit in California and probably the other unit where we are contemplating a powder plant.

Mr. Borland. Have you formed any tentative estimate of the cost of such a plant?

Col. McRoberts. I have not, personally.

Mr. Borland. Where did this estimate of $25,000,000 come from!

Col. McRoberts. That was worked out by the production division and the engineering division, based on plants in operation. We are building the plant, you know, in California.

Mr. Borland. A T. N. T. plant?

Col. McRoberts. Yes, sir; at the Hercules Powder Co.

Mr. BORLAND. That is a toluol plant, is it not?

Col. McROBERTS. No; it is for the nitrating of toluol.

Mr. BORLAND. Have we that listed here?

Col. McROBERTS. No; I mentioned it to you yesterday. The estimated cost, I believe, is $5,000,000. It was the plant I described as being extensions of individual units on their reservation at Hercules, Cal.

Mr. BORLAND. We are building that $5,000,000 plant on the grounds of the Hercules Powder Co. at Hercules, Cal?

Col. McROBERTS. Yes. It is estimated to cost $4,200,000, and its capacity is estimated at 3,500,000 pounds per month. These extensions are on the Hercules Powder Co.'s grounds, because, as I explained to you yesterday, it is impracticable for them to convey to the Government the individual, small sites for the different units of the plant, as they are really extensions of existing units, and the reservation covers a good many hundred acres.

Mr. BORLAND. What is the arrangement for operating it?

Col. McROBERTS. They build the plant and operate it for a fixed price per pound of the production. I do not recall the figures, but I can furnish them if you wish.

Mr. BORLAND. Yes; I wish you would furnish the terms of that contract and also the period of the contract. What, if anything, is the arrangement about disposing of the plant?

Col. McROBERTS. I will submit the contract itself. (See p. 370.) It is a plant that will be of little value after the war, as far as we can anticipate. The objection to that particular contract is that it is not on Government land, but it seemed, on the other hand, totally impracticable, and that it would cost a great deal more money to go and built it on Government land, because it would practically be of little value when you got through.

Mr. BORLAND. The manufacture there of T. N. T. is carried on side by side with the manufacture of T. N. T. by the Hercules people?

Col. McROBERTS. Yes.

Mr. BORLAND. Are the operations kept separate, or do we just take a certain part of their output?

Col. McROBERTS. That is why it is made a fixed price per pound, so it is not necessary to keep it separate.

Mr. BORLAND. We just take a percentage of the output?

Col. McROBERTS. We take all the output, covered by the increased facility.

Mr. BORLAND. We pay them for some of it, and the other part of it we own?

Col. McROBERTS. Yes.

Mr. BORLAND. What would be the effect under that kind of an arrangement if some disaster were to occur to the plant? Is it our T. N. T. or their T. N. T.?

Col. McROBERTS. Until it was delivered it would be their T. N. T. However, we furnish a large part of the raw material. We furnish the toluol, and we would lose the toluol, and they would lose the work they had put on it and the other ingredients—for instance, sulphuric acid, etc. I say that offhand.

Mr. BORLAND. That is a rather difficult question?

Col. McRoberts. It is rather difficult to interpret the contr without having given it very careful consideration.

Mr. Borland. As to the T. N. T. we are to buy from them, un it is delivered that would be strictly true. It is their T. N. T., a anything that occurs to it is their loss, but where our stuff is ming with theirs the question is not so easy. Is there anything in the co tract on that subject?

Col. McRoberts. I can submit to you a copy of the contra That would be the best answer to that question.

Mr. Borland. Yes; I wish you would.

Col. McRoberts. I can hardly recall that from memory.

Hercules Powder Company and United States of America.

ORDNANCE DEPARTMENT, UNITED STATES ARMY.

Fixed price contract—Construction of plant and manufacture of 42,000, pounds T. N. T.

These Articles of Agreement, entered into this ________ day of Februa 1918, by and between Hercules Powder Company, a corporation organized existing under and by virtue of the laws of the State of Delaware, and ha its principal office at Wilmington, Del. (hereinafter called the Contractor the first part, and the United States of America, by Samuel McRob Colonel, Ordnance Department, National Army (hereinafter called the Cont ing Officer), acting by and under the direction of the Chief of Ordnance, U States Army, and under the authority of the Secretary of War, of the se part:

Witnesseth,

Whereas a state of war exists between the United States of America an Imperial German Government and the Imperial and Royal Austro-Hung Government, constituting a national emergency; and

Whereas the United States urgently requires the immediate performan the work hereinafter prescribed, and it is necessary that this work be comple within the shortest possible time; and

Whereas the Contractor is a large manufacturer of explosives, has an orga zation capable of performing such work, has already made T. N. T., an ready to undertake the same, giving it precedence over its other business the terms and conditions herein provided:

Now, therefore, under the provisions of the laws of the United State such cases made and provided, and in consideration of the mutual agreen herein contained, it is agreed as follows:

CONSTRUCTION OF PLANT FOR MANUFACTURE OF TRINITROTOLUOL.

Article I. The Contractor within the shorest possible time shall pre designs and drawings, shall furnish labor, materials, tools, machinery, eq ment, facilities and supplies, expert engineers and operators, and shall do things necessary in and about the construction, completion, and putting operation of a plant for the manufacture of trinitrotoluol, hereinafter c T. N. T. or the explosive, located on land owned or leased by the Contra adjacent to its present plant at Hercules, Cal. The plant so to be constru shall include all necessary buildings, tanks, pipe lines, electric lines, appar machinery, tramways, barricades, bunk houses and other living accommo tions, foundations, and other parts and facilities essential to the proper op tion and functioning of the plant at a rated monthly capacity of approxima 3,500,000 pounds of T. N. T. The Contractor represents that the cost of plant will be in excess of $4,200,000.

The Contractor shall exercise its discretion in constructing the said pla and in equipping same in such manner that said plant and equipment will in all respects adapted to the successful manufacture of T. N. T. All pla drawings, and specifications, and all subcontracts and other writings in way relating to the construction and equipment of said plant shall at all times be subject to the inspection of the Chief of Ordnance.

UNITED STATES MAY FURNISH MATERIAL.

The United States may from time to time furnish the Contractor with all or any of the lumber, nails, cement, brick, and steel necessary for the construction of said plant: *Provided, however*, That the Contractor's undertakings therefor previously made in good faith are not interfered with. With respect to any materials and equipment necessary for the construction of said plant, the source of the Contractor's supply of which has failed or is likely to fail, or the delivery of which is likely to be delayed, it shall be the duty of the Contractor immediately upon being apprised of such failure or probable failure, or probable delay, to communicate such fact to the Contracting Officer, so that the United States may, if it is deemed desirable so to do, arrange for a supply of such materials or equipment necessary for the construction of such plant, and any delay in the performance of this agreement due to the failure to obtain such material or equipment shall not be deemed to be the fault of the Contractor. It is agreed that material and equipment furnished by the United States for the construction of said plant shall be furnished of suitable quality and in suitable quantities, and at proper times, and shall be charged to the Contractor at prices approximately those prevailing in the open market for like material and equipment in like quantities at the time of the signing of this agreement.

PLATINUM.

The United States agrees to furnish and deliver, at a price of not more than $105 an ounce, not more than 1,970 ounces of platinum. This is upon the Contractor's representation that platinum in that quantity is necessary for the construction of the plant.

EXCUSABLE DELAYS.

The Contractor shall not be held responsible for delays due to any fault or failure of the United States, or any public or private agency within the control of the United States, in furnishing material or service, or for any delays due to causes of whatsoever character beyond the control or without the fault of the Contractor, but simultaneously with the removal of such causes for delay the Contractor shall proceed with the construction of said plant and performance of this contract, due allowance for such delay having been made by extension of the schedule of deliveries, and the Contractor agrees, in view of the emergency necessitating this contract, to use its best efforts to remove such causes for delay.

T. N. T.

ARTICLE II. Immediately upon the completion of the construction of said plant the Contractor agrees to operate same to its full capacity and to manufacture and deliver to the United States 42,000,000 pounds crude, Grade III, trinitrotoluol. The explosive furnished shall be in accordance with the specifications hereto attached, made part hereof, and referred to in " Schedule 1."

DELIVERIES.

ARTICLE III. The Contractor agrees to deliver the explosive f. o. b. cars at the plant at Hercules, Cal., commencing during the month of September, 1918, and continuing at the rate of approximately 3,500,000 pounds per month until the entire quantity contracted for has been delivered.

ANTICIPATE DELIVERIES.

Time being of the essence, the Contractor undertakes to increase the production to such a maximum rate as facilities and equipment permit, and the Contractor will use its best endeavors to complete the performance of this contract at an earlier date than herein fixed, anticipating deliveries in so far as possible. The performance of this contract shall have precedence over all work other than for the United States or upon existing contracts with Allies of the United States. The Contractor shall, from time to time, and whenever requested so to do by the Contracting Officer, furnish to the Contracting Officer statements and reports on the progress of the work and any factors bearing on deliveries.

EXCUSABLE DELAYS.

The Contractor will not be held responsible for delays in delivery due to the delay of the United States in furnishing any material to be supplied by the United States, by delay in inspection, by changes in specifications, or by other delays due to any causes of any character whatsoever beyond the control of without the fault of the Contractor, but simultaneously with the removal of such causes for delay the Contractor shall proceed with the performance of this contract, due allowance for such delay having been made by extension of the schedule of deliveries. The Contractor agrees, in view of the emergency necessitating this contract, to use its best endeavors to remove such cause for delay.

STORAGE.

The Contractor shall use its best efforts to safely and adequately store not to exceed 1,500,000 pounds of the accepted explosive at the risk of the United States for a reasonable time without charge. Should the Contracting Officer direct such storage for a prolonged period, the Contractor shall store the accepted explosive at the cost and risk of the United States for as long a period as the Contracting Officer shall deem necessary.

Any lot of accepted explosive which the Contractor may be directed to put into storage pursuant to the provisions hereof shall be deemed to be delivered, and the Contractor shall be entitled to be paid therefor as if delivered f. o. b. cars at points of manufacture.

CONTRACTOR SHALL PACK, BOX, MARK, AND SHIP THE EXPLOSIVE.

The Contractor at his own expense shall suitably pack, box, and mark the explosive in containers meeting the requirements of the United States Interstate Commerce Commission regulations for the transportation of explosives. The Contractor at it own expense shall load the explosive on cars before or after storage, and at the cost of and as the agent for the United States shall ship the explosive to any point in the United States, making all arrangements for transportation, all according to the instructions of the Contracting Officer.

The United States shall make prompt inspection of all completed T. N. T and shall promptly furnish shipping instructions for accepted T. N. T.

PAYMENT FOR EXPLOSIVES.

ARTICLE IV. The United States will pay the Contractor for all explosive delivered and accepted pursuant to this contract, as follows:

(1) The sum of $0.435, adjusted as hereinafter provided, for each pound of said explosive delivered to and accepted by the United States, except that from all such payments there will be retained by the United States a sum equal to 5 per cent thereof until the sum so retained shall amount to $100,000, after which no additional sums shall be retained.

(2) Upon the certificate of the Chief of Ordnance that the performance of this Contract has been completed or that further performance has been waived the United States will pay to the Contractor the remainder of the compensation until then withheld, except that there shall be retained an amount sufficient to protect the United States on claims against the Contractor, if any, until the final settlement or adjustment of such claims.

The United States may make more frequent payments than herein contemplated.

The said contract price for manufacturing said explosive is based in part upon the cost to the Contractor of the following components as indicated:

Cost and quantities of certain components per 100 pounds of explosive.—

47 pounds C. P. toluol, at $1.50 per gallon; 154 pounds (on dry basis) 95% nitrate of soda, at $3.85 per 100 pounds; 64 pounds sulphur, at $22 per long ton. All f. o. b. Contractor's plant.

Should the price of any or all of said components advance over the foregoing, the United States will pay for each pound of T. N. T. delivered and accepted, an amount, in addition to the foregoing fixed price of $0.435, equivalent to such added cost of said components, but should the price of any or all of said components decline under the foregoing, the United States shall be entitled to credit for each pound of T. N. T. so that the price of $0.435 per pound shall be reduced by a sum equivalent to such decreased cost of said components.

Of the said contract price of $0.435 per pound, the sum of $0.105 is fixed as an allowance for and toward the partial amortization of the equipment and the plant referred to in Article I. When 42,000,000 pounds of T. N. T. have been delivered by the Contractor and paid for, no further allowance shall be made for amortization, and the price of all T. N. T. thereafter delivered shall be $0.33 per pound, adjusted to the cost of components as above.

To facilitate prompt payments, the United States may attach a disbursing officer to the main office or plant of the Contractor. No payments by the United States shall act to prevent the United States from later disputing the validity thereof under this contract.

The United States may from time to time furnish the Contractor with component materials relative to the performance of this contract: *Provided, however,* That the Contractor's undertakings therefor previously made in good faith are not interfered with. With respect to any component materials the source of the Contractor's supply of which has failed or is likely to fail, or the delivery of which is likely to be delayed, it shall be the duty of the Contractor, immediately upon being apprised of such failure or probable failure or delay, to communicate such fact to the Contracting Officer so that the United States may, if it is deemed desirable so to do, arrange for a supply of such component materials. Any delay or failure in furnishing such material shall not be the fault of the Contractor. Such materials will be charged to the Contractor at the prices set forth in the schedule of materials contained herein, and shall be paid for by reducing the price to be paid by the United States for the explosive by an amount equal to the total of the price so charged to the Contractor for the materials so furnished by the United States.

It is agreed that component materials furnished by the United States shall be in accordance with the requirements under the specifications.

CHANGES IN SPECIFICATIONS.

ARTICLE VI. It is agreed that the Contracting Officer may, by written notice to the Contractor at any time, make changes in the specifications or supplemental or substituted specifications which relate to, form a part of, or are added to this contract or in the provisions whereby the United States undertakes to furnish materials, or in the process of manufacture in operation at the said plant. If such changes involve substantially additional expense, a fair addition will be made to the purchase price; but if such changes involve substantially less of work or labor and material, a fair deduction may be made therefrom, all as shall be determined by the Contracting Officer. No claim for addition on account of any such change will be made or allowed unless the same has been ordered in writing.

ARTICLE VII. All component materials furnished under this contract, the plant, machinery, tools, and equipment, all workmanship in any way related to the subject of this contract, and the explosive, shall be at all times subject to inspection by the officers or agents of the Ordnance Department or persons designated by the Chief of Ordnance or the Contracting Officer, and the Contractor shall furnish reasonable facilities and assistance for such inspection.

ARTICLE VIII. The United States shall have the right to order at any time before completion of this order, and the Contractor shall thereupon supply such additional amount of the explosives as may be within the capacity of the plant hereinbefore referred to. The explosive so furnished shall be at the price and on the basis therefor, and on the terms hereinbefore fixed save that there shall be no allowance of $0.105 per pound for amortization upon the cost of the plant. Pending such notice by the United States, the Contractor agrees to accept no order from parties other than the United States for work of any description which would reduce the capacity of the plant used in the performance of this contract. The performance of additional order shall have precedence over work other than for the United States or upon existing contracts with allies of the United States. The United States may, with the consent of the Contractor, accept in full satisfaction of this contract such lesser quantities of the articles than the amount herein definitely contracted for as the Contracting Officer may designate.

ARTICLE IX. In the event of the Contractor's unexcused failure to have delivered or to have manufactured, complete, and ready for final inspection, the explosive or material required by the above schedule of deliveries to be delivered during the first five (5) month period of such schedule, or during any subsequent three (3) month period, the Chief of Ordnance, at his option, may refuse to accept and pay for the explosive or material which have not been delivered or are not manufactured, complete and ready for final inspection at the end of such period. Any such cancellation shall not affect the respective obligations of the Contractor and the United States hereunder to deliver and receive subsequent installments of the explosive.

In the event of the Contractor's unexcused failure to have delivered or have manufactured, complete, and ready for final inspection, the entire amount of explosive material hereby contracted for (less such cancellations as may be made under the foregoing provisions) by the date on which the final delivery is to be made, the Chief of Ordnance, at his option, may refuse to accept and pay for the explosive or material not delivered, or manufactured, complete, and ready for final inspection by such date.

Deliveries by the Contractor in advance of the dates or in excess of the quantities named in the schedule of deliveries may be applied upon subsequent deliveries.

In the event of such cancellation of this contract, or any part thereof, the Chief of Ordnance, after notice in writing to the Contractor, may procure any or all of the explosive, the delivery of which has been canceled, in the open market or in such other manner as he may deem for the best interests of the public service. The amount, if any, by which the cost to the United States resulting from such action shall exceed the price fixed will be charged to the Contractor upon proof by the United States that such excessive cost is not occasioned by conditions, such as increased labor costs and increased cost of the component materials of such explosive, which did not obtain or were not contemplated at the date of this contract.

ARTICLE X. This contract being necessitated by a state of war now existing between the United States of America and the Imperial German and the Imperial and Royal Austro-Hungarian Governments, it is desirable and expedient that provision be made for its cancellation upon fair and equitable terms in the event of the termination of the war. It is therefore provided that in such event the Chief of Ordnance may notify the Contractor that any part or parts of the explosive herein contracted for then remaining to be delivered shall not be manufactured or delivered.

In the event of such cancellation prior to the completion of the plant herein contemplated, the United States shall pay to the Contractor the costs to then expended toward the construction of the plant and the amount of all obligations incurred solely for the performance of such plant construction of which the Contractor can not otherwise be relieved. The United States will also pay to the Contractor the cost of the component parts and materials purchased in an amount not exceeding the requirements for the completion of this contract, which shall be in accordance with the specifications referred to in Schedule 1 hereto attached, and also all costs theretofore expended and for which payment has not been previously made, and all obligations incurred solely for the performance of this contract of which the Contractor can not be otherwise relieved. The United States will pay a further sum equivalent to ten (10) per cent of all such costs so expended in consideration of its right to terminate this contract, but said ten (10) per cent shall not apply on the cost of purchased component materials. Title to such increased facilities and materials so paid for by the United States shall forthwith vest in the United States upon such payment, and such increased facilities shall be removed at the earliest practicable moment from the premises of the Contractor in such manner as to leave the premises in usable condition.

In the event of such cancellation of this contract, following the completion of said plant, the United States will inspect the completed explosive then on hand and such as may be completed within thirty (30) days after such notice and will pay to the Contractor the price herein fixed for the explosive accepted by and delivered to the United States. The United States will also pay to the Contractor the cost of the component materials then on hand in an amount not exceeding the requirements for the completion of this contract, which shall be in accordance with the specifications referred to in "Schedule 1" hereto attached; and also all costs theretofore expended and for which payment has not previously been made and all obligations incurred solely for the performance of this contract of which the Contractor can not be otherwise relieved. The United States will (if it cancels this contract prior to the delivery and accepance of 42,000,000 pounds of T. N. T.) pay $0.105, hereinbefore fixed as an amortization allowance, for each pound of explosive then remaining to be delivered. To the above may be added such sums as the Chief of Ordnance may deem necessary to fairly and justly compensate the Contractor for work, labor, and service rendered under this contract.

Title to all such component material paid for by the United States in such event shall, immediately upon such payment, vest in the United States, but title to such plant shall in such event be and remain in the Contractor.

ARTICLE XI. The Contractor hereby, for the consideration herein named, waives and releases all lien or right of lien now existing or that may hereafter arise for work or labor performed or materials furnished or for any other reason or cause under this contract, under any lien laws, state or federal, upon any component parts, material, supplies, and the like coming into its possession, which it is herein contemplated shall presently or ultimately become the property of the United States, and the Contractor agrees not to create or suffer to be created any mortgage, lien, pledge, attachment, or other incumbrance upon any such component parts, material, supplies, or other such property in its possession intended to form a part of the articles to be delivered under this Contract. In the event that such mortgage, pledge, lien, attachment, or incumbrance is created the Contractor agrees to pay and discharge, or if it disputes the validity of the claim out of which such incumbrance arises, immediately to bond the same to the end that all property shall at all times be and remain free from all incumbrances.

ARTICLE XII. No Member of or Delegate to Congress or Resident Commissioner, is or shall be admitted to any share or part of this Contract, or to any benefit that may arise therefrom; but this article shall not apply to this Contract so far as it may be within the operation or exception of section 116 of the Act of Congress approved March 4, 1909 (35 Stats., 1109).

Neither this Contract nor any right to receive payment hereunder shall be assigned to any person, firm, or corporation.

The Contractor shall insert in every contract hereafter made for increased facilities, component parts, labor, material, supplies, and the like, or otherwise relating to the performance of this contract, a provision that such contract may be assigned by the Contractor and that it relates to a "main contract" between the Contractor and the United States.

ARTICLE XIII. No person or persons shall be employed in the performance of this Contract who are undergoing sentences of imprisonment at hard labor which have been imposed by the courts of the several States, Territories, or municipalities having criminal jurisdiction.

ARTICLE XIV. In addition to the ordinary precautions heretofore adopted by the Contractor for the guarding and protection of its plant and work, the Contractor shall provide, at the cost of the United States, such additional watchmen and devices for protection of the plant and property and the work in process for the United States against espionage, acts of war, and of enemy aliens as may be required by the Secretary of War. The Contractor shall, when required, report to the Secretary of War the citizenship, country of birth, or alien status of any and all of its employees. When required by the Secretary of War it shall refuse to employ, or if already employed, forthwith discharge from employment and exclude from its work any person or persons designated by the Secretary of War for cause as undesirable for employment on work for the United States.

ARTICLE XV. Except as this Contract shall otherwise provide, any doubts or disputes which may arise as to the meaning of anything in this Contract shall be referred to the Chief of Ordnance for determination. If, however, the Contractor shall feel aggrieved at any decision of the Chief of Ordnance upon such reference it shall have the right to submit the same to the Secretary of War, whose decision shall be final.

ARTICLE XVI. Wherever the term "Chief of Ordnance" is used in this Contract the same shall be construed to include the Acting Chief of Ordnance or any person designated to act as the Chief of the Ordnance Department, United States Army, or any person who is accredited as his duly authorized representative.

ARTICLE XVII. Notice under this contract when not actually given to the Contractor shall be deemed to have been sufficiently given to and received by the Contractor when mailed in a sealed postpaid wrapper addressed to the Hercules Powder Company, Wilmington, Del.

In witness whereof the parties have caused this contract to be executed under their seals (in sextuplicate) by their duly authorized officers the day and year first above written.

WITNESSES.	SIGNATURES.
	Hercules Powder Company, *Contractor.*
____________________________	____________________________
____________________________	____________________________
	United States of America,
____________________________	By ____________________________ *Colonel, Ord. Dept., U. S. Army, Contracting Officer.*

Schedule 1 Attached to and a Part of a Certain Contract Between the United States and Hercules Powder Company, and Dated the ________ Day of March, 1918.

Each and every of the pamphlets, drawings, specifications, and other papers enumerated is made a part of the schedule and of the order of which this schedule is a part.

"Specifications and method of analysis for pure toluol, mono-nitro-naphthalene, phenol, trinitrotoluol, and picric acid," G. E. 314-1, dated January 14, 1918.

Mr. Borland. Colonel, I would like to ask you about the additional facilities to produce nitrostarch and E. L. 104.

Col. McRoberts. The negotiations are not completed. There is one manufacturer who has successfully made nitrostarch. That is not quite right; but that company has been preeminently the most successful manufacturer—the Pennsylvania Trojan Powder Co. We have given them a large order for an increase of their plant, although they are increasing it themselves with Government aid. It is under discussion whether or not we should not increase that plant to meet our needs. The other makers, principally the Du Ponts, do not seem to have done it as successfully as this concern.

Mr. Borland. What is the name of the first concern you spoke of?

Col. McRoberts. The Pennsylvania Trojan Powder Co., in Pennsylvania. I do not know the exact location of it.

Mr. Borland. How much of that particular product do we need?

Col. McRoberts. I think it is 60,000,000 pounds on the present negotiations.

Mr. Borland. Is that for high explosives?

Col. McRoberts. Yes. It is what we might call a substitute explosive, although it is the cheapest explosive we have.

Mr. Borland. Cheaper than T. N. T.?

Col. McRoberts. Yes. It does not lend itself well to many things. At the present time they do not feel it is suitable for anything except hand and rifle grenades and trench-mortar shells. It is considered too sensitive or too unstable an explosive to use in high-explosive shells or things that have to be fired under great concussion.

Mr. Borland. Would it be possible to enlarge this Trojan plant to make the quantity we want?

Col. McRoberts. It is claimed by the manufacturers that it is. We have some difficulties about it, too, because their process is a secret process, and there is a question of what is equitable. If they extend the plant and take Government contracts, we will have to put Government inspectors in the plant, and it gives away what it has taken them a good many years to develop; and we are negotiating, trying to find some equitable plan.

Mr. Borland. If we build our own plant have we not a right to use the process?

Col. McRoberts. It is a secret process.

Mr. Borland. Have we the process or can we get it?

Col. McRoberts. Not unless somebody gives it to us. We can not commandeer what a man has in his mind and get it, you know, unless he is willing.

Mr. Borland. I was simply trying to ascertain how far you have gone toward spending this particular estimate.

Col. McRoberts. Well, we may change from that; I do not know. It is in process of development.

Mr. Borland. You do not know that you will need this?

Col. McRoberts. I should say we would, because it is a cheap form of explosive which seems to be satisfactory, and I think we would use it for hand and rifle grenades anyway, and for trench mortars, even if we had an abundance of another supply.

Mr. Borland. Is the same thing true of EL 104?

Col. McRoberts. I do not remember what that is.

Mr. Borland. That is not an article we are now using.

Col. McRoberts. No; it is not. I do not identify it by that name.

Mr. Borland. Colonel, you have put in an item for housing at nitrate plants 1, 2, 3, and 4. Was that done under your office?

Col. McRoberts. It is a part of the contract; yes.

Mr. Borland. The contractor builds that as a part of the plant?

Col. McRoberts. Yes; it is a part of the plant covered by the contract, but it is supervised and subject to the approval of the housing committee of the War Department.

Mr. Borland. Was it estimated in the original construction cost of the plant?

Col. McRoberts. I think not. I think the original estimate was only $20,000,000, and there was considerable added to it. I am quite certain that that was not in their original estimate.

Mr. Borland. You have not had the active duty of building that housing?

Col. McRoberts. No, sir; that is being built under contract and under supervision of the nitrates division. They only come to me on questions involving the contract. I have not had anything to do with the supervision of that.

Mr. Borland. As to the other housing you are going to build at the other plant, I presume you refer that to the regular housing committee?

Col. McRoberts. Yes.

Mr. Borland. Did you have anything to do with purchasing these guns from Chile?

Col. McRoberts. The only thing I know about those guns is that that was up some time ago and Col. Hughes called my attention to it, I think, originally, and then I called it to the attention of Gen. Wheeler, and heard nothing more about it until the other day, when Gen. Williams said that the Chief of Staff asked how he could get those guns, and I answered, "Give us an order to get them and we will get them for him." I do not know whether they belong to Chile or not; I have not investigated that. If they belong to Chile we will commandeer them, and if they do not, we will simply negotiate for them under a contract.

Mr. **Borland.** It would be the other way around, would it not? If they do not belong to Chile you will commandeer them.

Col. **McRoberts.** If they do not belong to Chile we will not have to commandeer them. If they are under contract for delivery to Chile we will have to commandeer them.

Mr. **Borland.** Yes. If they have already been delivered to Chile, you could not commandeer them?

Col. **McRoberts.** No; but obviously, they can not be delivered to Chile on American soil, and we are safe on that.

Mr. **Borland.** You spoke of a silk-thread plant. Where is that located?

Col. **McRoberts.** A silk-cloth plant?

Mr. **Borland.** Yes.

Col. **McRoberts.** At Woonsocket R. I. We made no investment for plant, although extensions up to $225,000 are contemplated for future requirements for spinning only.

Mr. **Borland.** Under what terms and arrangements was that acquired?

Col. **McRoberts.** Again, I will have to ask indulgence and give you a memorandum on that, because it is so easy to get these figures mixed.

CONTRACT WITH ALLIED SILK TRADING CORPORATION FOR 6,900,000 YARDS OF CARTRIDGE CLOTH.

Profit of 7½ per cent on all costs is allowed by Ordnance Department, which figure was decreased to 3 per cent at the instance of the Allied Silk Trading Corporation.

Cloth is manufactured and processed at 10 spinning mills and 9 weaving mills scattered over the New England States, and the main offices of the Allied Silk Trading Corporation are at 17 Madison Avenue, New York City.

We are contemplating centralizing the purchase of all American-made cartridge cloth in the Allied Silk Trading Corporation, and a contract to that end is being drawn up for 10,000,000 additional yards of material. Later it may be necessary to purchase from 15,000,000 to 35,000,000 yards of additional material. In this connection, it is planned for the Government to erect a spinning mill at the plant of the Woonsocket Spinning Co., Woonsocket, R. I., same to cost $225,000 complete, and to result in approximately 60,000 pounds per week additional noil yarn. This property will be Government owned and will be erected by the Woonsocket Spinning Co. at a profit of $1. That concern will receive its profit on the noil yarn which is spun in this mill during the war. Land is to be leased by the United States Government for the sum of $1, and at expiration of contract or extension thereof, the Government is to remove building from land within period of one year. Allied Silk Trading Corporation will be given profit of 3 per cent on all costs of new contract with exception of profit on cost of increased facilities.

We have bought through that organization up to date about 6,900,000 yards of silk. They get the raw silk and produce the silk cloth at various plants located in New England States suitable for the powder bags on a basis of so much a yard. I will give you the exact terms in a memorandum which I will submit. They have recently reduced the price voluntarily.

Mr. **Borland.** Did we construct the plant, or was the plant already in existence when we took it over?

Col. **McRoberts.** We are contemplating enlarging the Woonsocket plant at Government expense.

Mr. **Borland.** What is the name of the concern?

Col. **McRoberts.** The Allied Silk Trading Corporation.

Mr. BORLAND. Were they in the silk-textile business?

Col. MCROBERTS. No; it was formed by certain people in the silk-spinning business. It was more or less a patriotic effort to assist the Government. They said at the time that the rate of compensation was to insure them against loss. It has a nominal capital, because the Government furnishes the raw material to them, and as they progressed they found their estimate of that compensation was high, as a result of actual operation, so they voluntarily reduced it and reserve the right to reduce it further if their operations justify it.

Mr. BORLAND. Where does the Government get the silk it furnishes them?

Col. MCROBERTS. Largely from Japan.

Mr. BORLAND. The Government imports it?

Col. MCROBERTS. This company imports it for Government account.

Mr. BORLAND. Does our Government import it or does some individual import it?

Col. MCROBERTS. This company imports it. They handle the transaction. We pay for the raw silk.

Mr. BORLAND. And they work it up into these bags?

Col. MCROBERTS. They work it up into silk cloth. The bags are not made there, but just the silk cloth for the bags.

Mr. BORLAND. Where are the bags made?

Col. MCROBERTS. The cartridge cloth, thread, and other components necessary for cartridge-bag manufacture are shipped to Picatinny Arsenal, where they are inspected and measured. From the arsenal these materials are delivered to various firms engaged in light stitching work who cut the cloth and manufacture the bags. The bags are then shipped directly to the loading plants where the propellant charge is assembled and packed for overseas use. Requirements call for about 50,000,000 propelling charges.

It has been an industry of a very important nature. They showed me some of the silk bags the other day. We have got the price way down to a mere fraction of what we thought originally it was going to cost. There has been a great deal of experimentation and we conducted most of the experiments at the Picatinny Arsenal.

Mr. BORLAND. How much of an investment have we in this Woonsocket plant?

Col. MCROBERTS. None. The plant extensions will cost $225,000.

Mr. BORLAND. Have we any arrangement for disposing of it?

Col. MCROBERTS. No.

Mr. BORLAND. It is a silk-weaving plant?

Col. MCROBERTS. I can not give you the character of the plant.

Mr. BORLAND. Evidently it is a silk-textile plant.

Col. MCROBERTS. Just the character of the plant I can not give you. I will submit a memorandum on that. It is a matter that was done before I came here.

Mr. BORLAND. Have you any other plants in connection with this supply of ammunition that we have not been over?

Col. MCROBERTS. I do not know of any that has not been mentioned.

Mr. BORLAND. Under armament of fortifications B, Artillery, have you any plants under that appropriation?

Col. MCROBERTS. Government-owned plants?

Mr. BORLAND. Yes.

Col. MCROBERTS. We have the Symington plant, and the brakeshoe plant is Government owned.

Mr. BORLAND. Let us understand about the Symington plant. You have two branches there and one is for shell?

Col. MCROBERTS. Yes; and we have a gun plant there also.

Mr. BORLAND. Do you keep those plants separate?

Col. MCROBERTS. They are operated separately; yes.

Mr. BORLAND. Is the investment kept separate?

Col. MCROBERTS. Yes.

Mr. BORLAND. One of them comes under one appropriation and the other under another.

Col. MCROBERTS. The work is entirely separate. It is an entirely different character of work.

Mr. BORLAND. I think you have stated about the Symington gun plant. How much is the investment in the gun plant?

Col. MCROBERTS. About $4,000,000.

Mr. BORLAND. And they machine the guns there that come from the Illinois Steel Co.?

Col. MCROBERTS. No; I think that comes from the Buckeye Co. at Chicago.

Col. HUGHES. And also from the Standard Forgings Co. and the Bethlehem Steel Co. There are three sources of supply for that particular forging.

Mr. BORLAND. Do they finish the guns?

Col. HUGHES. Yes, sir.

Mr. BORLAND. Do they make any carriages?

Col. HUGHES. No, sir.

Mr. BORLAND. They make the inner tubes?

Col. HUGHES. They make the whole gun complete, sir.

Mr. BORLAND. Have you any other Government plant except the Symington?

Col. MCROBERTS. Yes; we have a number of Government plants. I think perhaps the more correct way would be to submit a list of those plants; but to simply run over them here we have the Symington plant, the Brake Shoe plant—that is a Government plant, is it not, Major?

Maj. BAKER. Yes, sir.

Col. MCROBERTS. Have you a list of them there?

Maj. BAKER. I have a list of the 155-millimeter plants, which is the size for which we have the largest number of such plants. There is the American Car & Foundry Co., the Curtis Co., Barlett & Hayward Co., William Wharton, jr., & Co., Neill, Morris & Co., Twin City Forge & Foundry Co., Chicago Railway Equipment Co., American Clay Machinery Co., New York Air Brake Co., North American Motors Co., William J. Oliver Manufacturing Co., Wagner Electric Manufacturing Co., Harroun Motor Corporation, International Arms & Fuse Co., Standard Sanitary Manufacturing Co., Pullman Co., Winslow Bros. Co., Detroit Shell Co., Jackson Munitions Corporation, and one other plant, the name of which has not been decided, which is the one that Col. McRoberts spoke of this morning, which is to be built in the Middle West by the Symingtons for the manufacture of 155-millimeter shells.

Col. MCROBERTS. Those are all shell plants.

Mr. Borland. Then they all come under C, which we have been discussing this morning?

Col. McRoberts. Yes. No doubt Col. Hughes could give you a list of the gun and carriage plants.

Mr. Borland. There is such a long list of those plants that I would be glad to have you prepare the list for the members of the committee.

Col. McRoberts. We will be very glad to do so.

Mr. Borland. It may be—and I think it will be—that we will want to have further hearings upon those things.

Col. McRoberts. If you have a particular question that pertains to carriages, guns, and artillery, Col. Hughes would be available; if it pertains to shells, Maj. Baker will be available; and if it pertains to anything else, you can get it by communicating with Maj. Fairchild.

Mr. Borland. Have you a list there of the gun plants?

Col. Hughes. I have a list of both the gun and carriage plants; yes.

Mr. Borland. It might be well for you to run over them as Maj. Baker did and give us some idea about them.

Col. McRoberts. Col. Hughes can do that for you.

Mr. Borland. Let us get a clear understanding about this. I am only asking about plants which we own or plants in which we have invested something.

Maj. Baker. All I mentioned were Government owned.

Mr. Borland. Let us start with the plants the Government owns. Are there any plants that we own?

Col. Hughes. These are the plants the Government owns: Symington-Anderson, Minneapolis Steel & Machinery Co., and Dodge Bros. They are the plants we own.

Mr. Borland. What are the plants to which we have furnished a substantial part of the equipment?

Col. Hughes. The Buckeye Steel Castings Co., Willys-Overland Co., Singer Manufacturing Co., Carbon Steel Co., Bucyrus Co., Standard Forgings Co., Wisconsin Gun Co., Walter Scott & Co., Heppenstall Forge & Knife Co., Northwestern Ordnance Co., Carnegie Steel Co., Bullard Engineering Co., Edgewater Steel Co., Standard Steel Co., Tacony Ordnance Co., Standard Steel Car Co., Otis Elevator Co., Mesta Machine Co., Morgan Engineering Co., and New Britain Machine Co., that is all.

Mr. Borland. You will furnish the committee with a list of those gun plants and the details in regard to them?

Col. Hughes. Yes, sir.

Mr. Borland. I wish you would also furnish the committee with the amount of the investment in each one of the plants we do not own, and what facilities we have furnished.

Col. McRoberts. Very well, sir.

Mr. Borland. Gen. Dickson agreed to furnish us with a list of these plants, but we have not yet received it. It is possible that he has it underway. If you will get in touch with his office you will find that he has possibly gotten such a list underway, but we do not want to let it go too late, because we must finish the preparation of our bill.

Col. McRoberts. He would get such a list from us anyway.

Mr. Borland. I do not know whether this question would come within the range of information contained in your office, but if you can I would be glad to have you state to the committee whether, in view of the existing program of the War Department for the forces in France and the ordnance necessary for those forces, and in view of the enlarged program upon which the War Department has entered you have assurances that you will be able to keep up the production and procurement end of it to meet the requirements of that sort of a program. I will be glad to have you state your best judgment on that.

Col. McRoberts. Assuming that England and France will carry out the arrangements entered into for the material they are to furnish, I see no reason why we need anticipate any shortage of ordnance material at any stage of the game. I mean any important item or any material item.

Mr. Borland. That means, therefore, that if France and England can keep our troops supplied during the balance of the calendar year 1918, we thereafter will be able to develop our resources to a point where we can take hold and keep them supplied from that time on, even according to the enlarged program?

Col. McRoberts. That question does not quite reflect the situation. If they can supply us with the particular material, not all, but the particular material that they have agreed to supply during the year 1918, I see no reason why we can not take care of the situation from that time on.

Mr. Borland. And that applies not only to the former program, but to the enlarged program as announced b ythe Secretary of War?

Col. McRoberts. Yes, sir.

Mr. Borland. Are there any links in the whole chain where there is any difficulty in view? Are you going to get guns, shells, explosives, and everything else?

Col. McRoberts. You will recall that the whole program was changed at the time of the interallied conference for the purpose of unifying calibers. At that time it was recognized that the American production would be set back, and the English and French felt that they could easily supply whatever was needed to cover that period. Now, assuming that they are able to carry out their end of it, I do not see that there is any particular weak spot in it. Based on our requirements, which, of course, include, I assume, ample reserves, we will not have explosives in excess this year; in fact, it will require some shifting, for instance, the use of more amatol than they probably would otherwise use and a different percentage of ammonia and nitrate than would otherwise be the case. But the way to meet that situation seems to be easily seen and attainable.

Mr. Borland. You are a reserve officer, are you?

Col. McRoberts. No, sir; I am an officer in the National Army.

Mr. Borland. Then you are drafted by the board?

Col. McRoberts. Yes, sir; I enlisted.

Mr. Borland. But the National Army was drafted.

Col. McRoberts. Well, I was not drafted, obviously, because I am not in the draft; I am sorry to say I am too old, but I would like to be in the draft.

Mr. Borland. Broadly speaking, you were brought into the Ordnance Department as a business man?

Col. McRoberts. Yes, sir.

Mr. Borland. Your business is banking?

Col. McRoberts. Yes, sir.

Mr. Borland. How long had you been engaged in that business?

Col. McRoberts. Ten years in strictly banking business.

Mr. Borland. You have had executive places in manufacturing and public-service corporations?

Col. McRoberts. For some 10 years previous to that time I was financial manager of the Armour interests, the treasurer and manager of their investment interests, which involved banks, public-service concerns, manufacturing plants, and so on.

Mr. Borland. And you are contributing to the work of the Ordnance Department the executive experience you have had?

Col. McRoberts. For whatever it is worth; yes.

Mr. Borland. Have you exercised a personal supervision over the contracts that have been made since you came into the department?

Col. McRoberts. The contracting proceeds there at the rate of between 75 and 100 contracts a day. It is impossible for any one person to participate in all the negotiations. The Procurement Division is organized into sections, all of the sections reporting directly to the chief of the division. The office of the chief of division is relieved somewhat by a number of staff officers, who are not assigned, but who assist the head of the Procurement Division. All of these negotiations ultimately result in contracts. They are negotiated by a particular officer in a section, passed upon by the head of the section, passed on by the financial side of the division, passed on by the legal department, or what we call the contract department, which is composed of lawyers, and eventually is reviewed either by the head of the section or one of the staff officers. If it is a matter of unusual interest, or of importance, it is reviewed by the head of the division, otherwise it may not come to the attention of the head of the division.

Mr. Borland. Approximately how many contracts have you made?

Col. McRoberts. Something over 14,000 have been made by the Ordnance Department.

Mr. Borland. Since what date?

Col. McRoberts. Since the beginning of the war, and most of them have been made this year. I should say that about 500 were made previous to the present reorganization.

Mr. Borland. And by that you mean last November?

Col. McRoberts. Yes. Many of the negotiations, though, were under way, and work had been instituted in a great many cases where the contracts were not closed until some time this year.

Mr. Borland. Who decides on these questions of building new plants and installing facilities in old plants? That is not an ordinary contract, is it?

Col. McRoberts. No. The matter of the location of a new plant has the consideration of the Procurement Division in conjunction with the contractor in order to get the elements. We ordinarily consult with the construction division and sometimes with the engineering division, if there are any questions in which they are interested. After a tentative proposition is worked out the War Industries Board is consulted in respect to transportation and the general industry of the country, and if it is a very important matter it is also discussed with the Secretary of War's office, and there may be much advice volunteered by various bodies.

Mr. Borland. Colonel, what body or bodies are your contracts submitted to under your present organization?

Col. McRoberts. A copy of the contract is filed with the Interior Department, with the Treasury Department, and listed, at least, with the War Industries Board.

Mr. Borland. What is the purpose of filing a copy of the contract with the Interior Department?

Col. McRoberts. I do not know, but that is required by law.

Mr. Borland. Do they exercise any power?

Col. McRoberts. We have not seen any evidence of it, but it is in compliance with a statute. This particular filing of contracts is required by statute.

Mr. Borland. What happens when you file a contract? That is what I want to know. Nothing happens, I presume.

Col. McRoberts. We have indications that they examine them.

Mr. Borland. The purpose of filing a copy of the contract with the Treasury Department is to give the Comptroller of the Treasury due notice of the obligation?

Col. McRoberts. Yes.

Maj. Fairfield. We received word yesterday that they had cut the number down to three.

Col. McRoberts. We used to have to file six copies of the contract, but that number has been reduced to three at our request.

Mr. Borland. What is the third one filed?

Col. McRoberts. With the Ordnance Department.

Mr. Borland. What body or bodies participate in the making of the contract? Do you make the contract finally and completely in your own department?

Col. McRoberts. Yes, sir.

Mr. Borland. Does the War Industries Board exercise any power over the making of contracts?

Col. McRoberts. All contracts for raw materials, where there is a shortage, are cleared through the War Industries Board, and the terms, as a rule, are fixed there. Take metals, like copper, zinc, and lead, and they will fix the price, and the same is true of steel. The price of all raw materials, of which there is a declared shortage, is fixed by the War Industries Board, and the contracts are cleared through that board, and then we get an allotment.

Mr. Borland. When a contract involves those raw materials, you must submit the proposed contract to the War Industries Board, and they will allot you a certain amount of those materials, or to the contractor?

Col. McRoberts. Yes, sir.

Mr. Borland. And that board fixes the price.

Col. McRoberts. Yes, sir. That is fixed not only for us but for others using the same materials, and a division is made; that is what it amounts to. On all new facilities the War Industries Board is consulted, and that is at the direction of the President. It is done with the idea of disturbing the industries of the country as little as possible, or, at least, not disturbing them unnecessarily. On matters where there is likely to be strong competition between the different departments—for instance, machine tools—they have a committee of the War Industries Board that has listed the country and made a survey, and we discuss it with that committee, so that they are kept advised all the time of what our requirements are and what our plans are. They also are consulted on matters affecting the country generally, such as electrical generators affecting the production of power. All of these subjects are more or less classified, and we have commodity committees formed, on which some officer representing the Procurement Division of the Ordnance Department attends, and we keep in touch with the requirements of the industries of the country and of the other departments of the Government. Very often that leads to a discussion of the contract—the form of the contract for a new plant facility. I think all new plant facility contracts are discussed and the terms of the contracts approved by the War Industries Board, either formally or informally.

Mr. BORLAND. How long has that been the case?

Col. MCROBERTS. Ever since I have been in Washington.

Mr. BORLAND. These new plant facility contracts are submitted to them, and they examine into the proposed terms?

Col. MCROBERTS. They do not require that, because that would cause a great deal of delay, and I do not think it has been practical to submit contracts for approval, but we discuss the terms and agree on terms. For instance, all of these plant facilities that we have been discussing were approved by the War Industries Board, not in detail, probably, but in the general terms.

Mr. BORLAND. Do they exercise any veto power over your contracts?

Col. MCROBERTS. They have no power over the contracts themselves, but they simply act in an advisory capacity.

Mr. BORLAND. But they have a veto power in regard to furnishing materials?

Col. MCROBERTS. Yes; on the allocation of materials, where there is a shortage, they have a very practical veto.

Mr. BORLAND. What is the priorities committee? Is that a branch of the War Industries Board?

Col. MCROBERTS. That is simply a committee of the War Industries Board.

Mr. BORLAND. That is the committee which passes upon the relative claims of the different departments?

Col. MCROBERTS. Yes, sir.

Mr. BORLAND. Where do they rank the Ordnance Department?

Col. MCROBERTS. Our priority has been very low. I do not believe, until very recently at least, that we have been better than twelfth on the priorities list.

Maj. BAKER. That is substantially correct, except in certain instances. On shells, we rank about third.

Col. MCROBERTS. That is for shell steel.

Maj. BAKER. Yes, sir.

Mr. BORLAND. How about steel for gun forgings?

Col. HUGHES. We rank well up on the list on that.

Mr. **Borland**. How far up?

Col. **Hughes**. I do not know exactly.

Col. **McRoberts**. Not so very far up.

Mr. **Borland**. Who ranks ahead of you?

Col. **McRoberts**. The Navy for one; the Shipping Board, and some cases, the allies.

Mr. **Borland**. That only accounts for three ahead of you.

Col. **McRoberts**. I would have to check up the specific cases a find out just what our rank is and those who are ahead of us. course, you have the Aircraft Board, the Quartermaster Departme and the different activities.

Mr. **Borland**. The requirements of the Navy have passed t point where they are very urgent, have they not? In other wor The Navy is pretty well equipped?

Col. **McRoberts**. They do not think so.

Mr. **Borland**. The Navy has guns to sell.

Col. **McRoberts**. They think they are well equipped, but th Bannerman guns you are speaking of were sold years ago. Howev it is not so much on the question of guns as it is on the question machine tools.

Mr. **Borland**. And fuel?

Col. **McRoberts**. Yes, sir; the Ordnance Department has parti larly suffered with regard to fuel, and I think the ordnance pla have ranked too low on fuel distribution. However, that is a matt about which Col. Tripp could give you more information than I c give you, because he knows all about that situation.

Mr. **Borland**. I thought that came under you.

Col. **McRoberts**. No; fuel and transportation is under Col. Tri

Mr. **Borland**. Have you anything further to offer?

Col. **McRoberts**. Nothing occurs to me particularly. We will f nish you with these statements that you wish and those finan statements just as soon as they can be prepared. We are do everything we can to get them quickly.

Mr. **Borland**. When we get those statements in regard to the va ous plants we may want to recall both of these gentlemen and amine them more in detail.

Col. **McRoberts**. We are all at your service. The more you kn about the Ordnance Department, the better it is for the Ordna Department.

Mr. **Eagan**. Has your rank on the priority list interfered seriou with your work?

Col. **McRoberts**. It has at times, on the question of transportati and fuel, but, as I have said, Col. Tripp can answer you more d nitely on that subject.

Mr. **Eagan**. That is not a factor now?

Col. **McRoberts**. No, sir; it is not so serious.

Mr. **Good**. In acquiring any of these plants, has any considerati been given to the question of constructing them in such a way th they could be used for some purpose after the war?

Col. **McRoberts**. The general economic question has always b considered, but our activities have been, probably, more toward avo ing the construction of a plant as a temporary matter of too pr nent a nature. It has been our concern, in other words, to keep t contractor from building an ostensibly temporary plant into a permanent plant for his own benefit. We have not had any difficulty about that, but we have checked it up to see that it was not done.

Mr. GOOD. Some parts of the plants must necessarily be permanent because of the strength required. Your power plants, for instance, connected with those plants must necessarily be permanent plants?

Col. MCROBERTS. Yes, sir; but there are few cases where we have had to build independent power plants.

Mr. GOOD. For instance, take plants at which you are making gun forgings or machining guns. Those plants would necessarily be quite permanent, would they not?

Col. MCROBERTS. They must be substantial, because both of those plants require cranes, which means a substantial structure, but the plant part of that is a very small part of the cost. It is chiefly in the equipment.

Mr. GOOD. In those plants, if I understand you, the contracts do not provide anything with regard to the disposition of the plants after the emergency is past?

Col. MCROBERTS. As a rule, they do not.

Mr. GOOD. In the case of those plants which are simply additions to existing private plants, your contracts are so drawn that the owner of the private plants will gradually become the owner of the additions that the Government builds?

Col. MCROBERTS. There is no fixed rule about it, but in many cases that is true.

Mr. GOOD. In those cases where no consideration has been given to to that in the contract, what is the plan, if there is any, with regard to the disposition of the additions? Have you arrived at any plan in regard to that?

Col. MCROBERTS. No, sir; there is no plan, and, apparently, there is none possible at the present time. This sudden great need has required the creation of facilities that no one apparently can foresee any use for, and to attempt to arrange for the disposal of them at this time would practically mean giving them away. There is nothing to be gained by it. So far as we can see, there is nothing to be gained by an attempt to arrange for the disposal of them at this time.

Mr. GOOD. When it was decided to discontinue the manufacture of 3-inch guns and the ammunition or shells for 3-inch guns, and to manufacture the 75-millimeter guns, what was done in regard to the question of damages where the manufacturer had only progressed to the point of manufacturing the dies, gauges, jigs, etc.?

Col. MCROBERTS. At that time practically all of those contracts were cost-plus contracts.

Mr. GOOD. They were all cost-plus contracts?

Col. MCROBERTS. The change was made at the Government's expense, anyway.

Mr. GOOD. Was that true of the guns?

Col. MCROBERTS. I think that, outside of the Bethlehem and Midvale companies, that was the case.

Mr. GOOD. And the shell contracts were cost-plus contracts?

Col. MCROBERTS. Not all of them.

Maj. BAKER. In most cases they changed the construction of the 75-millimeter shall to the 3-inch size without any cost to us at all. They absorbed the cost of retubing in anticipation of large contracts continuing throughout the war. That was the case in almost all of those contracts. The other question raised refers to the machinery and equipment in those plants; all that machinery and equipment is tagged and stamped "Government property," even if it happened to be in the portion of the plant owned by the contractor. It is all tagged and marked "Government property" and it will be available for removal by the Government when the contract is finished.

Mr. **Good**. That is to say, you gave a new contract for the 75-millimeter shells to take the place of the canceled contract for the 3-inch shells, and you added to the contract price whatever damage the contractor sustained because he had made dies, jigs, gauges, etc., for the 3-inch shells?

Maj. **Baker**. They fell into two classes In the first class, which was the major class, they did not ask for any reimbursement whatever, in anticipation of the large requirements of the Government They simply absorbed their cost in anticipated contracts for the 75-millimeter shells. In some few cases we had to liquidate their actual expenditures of money for their equipment and tooling, but they were very urgent cases. In no case did we absorb that cost by an increased cost of shells, to my knowledge.

Mr. **Good**. In any case did you give a contract for the 75-millimeter shells in excess of the contract price for the 3-inch shell?

Maj. **Baker**. No, sir.

Mr. **Good**. The same thing is true, I take it, of the guns?

Col. **McRoberts**. We did not have to settle anything in the way of damages.

Mr. **Borland**. As to the guns, my recollection is that it was testified here that the guns that were far enough along to have to be completed as 3-inch guns were completed as 3-inch guns, and that they only turned them into 75-millimeter guns when the manufacture had not reached such a stage that there was any change necessary.

Monday, May 27, 1918.

PRODUCTION OF ORDNANCE MATERIAL.

STATEMENT OF COL. GUY E. TRIPP, NATIONAL ARMY, HEAD OF PRODUCTION DIVISION, ORDNANCE DEPARTMENT.

STATUS OF WORK.

Mr. **Borland**. Colonel, you are at the head of the Production Division of the Ordnance Department?

Col. **Tripp**. Yes, sir.

Mr. **Borland**. How long have you been such head?

Col. **Tripp**. Since January 16 of this year.

Mr. **Borland**. That was when the present reorganization was completed?

Col. **Tripp**. Somewhat before that time.

Mr. **Borland**. What are the duties of the Production Division?

Col. **Tripp**. To follow and accelerate as much as possible the production of ordnance supplies.

[Pages 389-417 not printed.]

ORGANIZATION.

Mr. Slemp. Have you placed in the record a statement of your method of following production, or the organization of your department with reference to that?

Col. Tripp. No, sir; I have not.

Mr. Slemp. Would you object to having that stated for the record?

Mr. Borland. We will be glad to have a statement of that.

Mr. Slemp. What method have you for keeping in touch with plants and following out the programs—by daily, weekly, or monthly reports?

Col. Tripp. In the first place, as descriptive of the organization we have organized the Washington end of the department into a certain number of sections, each roughly subdividing the work in the manner that the old departmental organization of the Ordnance Department divided it. We have a cannon section, and under that section we have a cannon branch and a carriage branch. The work of that section is described by the name of the section. We also have an ammunition section, which has to do with artillery ammunition; an explosive section which has to do with propellants and high explosives; a tractor and truck section, taking care of tractors and trucks; a small-arms ammunition section, or a small-arms section, taking care of small arms and ammunition, including machine guns and equipment, and taking care of the entire equipment of the soldier as an individual, and included in that would be the harness and other more or less personal equipment. Then, there is a plant-facilities section, having charge of the new plants going up and paid for by Government money. Then we have an administrative section that administers the general statistical and office work.

Col. Hunt is in general charge of the cannon section and the ammunition section, the carriage branch being under the charge of Maj. Scrugham, and the ammunition branch under Maj. Bruce. The explosives section is under Maj. Moxham; the tractor and truck section is under Maj. Hooper; the small-arms section is under Maj. Reams; and the plant-facilities section is under Maj. Sargent. The Washington office is a directive, administrative, and expert body. We have 10 branch offices under 10 district managers. Those men are all civilians, chosen with considerable care, being men who have demonstrated their ability, and under them is the work of following production in the field. Each district is connected with the others, and all the districts are connected with the Washington office by private telegraph lines. We have telegraphic instruments in each district office and telegraphic instruments down here in our office. We have telegraphic communication with all of those districts when we want information from them, and we have regular reports coming in weekly from the inspectors as to deliveries, and semimonthly from our district managers, who report in great detail upon every contract in their districts. They go generally into the question of the capability of a concern's management, its shop equipment, and they give their opinion as to the probability of deliveries.

In addition to that, we have a corps of experts, as you would, perhaps, call them, or staff men, who are following particular pieces of artillery crosswise the organization. For example, we have Mr.

oleman, who is president of the Bucyrus Co., who is following the 5-millimeter artillery matériel, starting with the gun and going hrough to every part that makes it a complete piece of artillery. Ve also have Mr. Humphrey, president of the Westinghouse Air-rake Co., who is following the 75-millimeter and 4.7-inch guns, and Ir. Davis, who is following optical instruments. We have Mr. Iarbeck, of the American Can Co., following the loading of shells; Ir. Blood, of the Whitney Co., following the booster, adapter, and fuse situation. Then we have Col. Barbett, a steel expert, and Mr. Chase, also a steel expert, following the question of manufacturing steel, the difficulties of heat treatment, etc. In addition to those men, he heads of our sections, whom I have named, are men of great ability in their particular lines, and they have had large experience. The organization, of course, is as good as its personnel, because it is impossible to have a smoothly working organization organized in a very few months or weeks. I hope the war will not last long enough to have it a smoothly working organization, but we have very intelligent men working with as great cooperation as it is possible for men to work who have been thrown together for so short a time. I believe that production is being followed intelligently, and that the work that is being done is helpful to the manufacturer. It is helpful in aiding him to solves his difficulties and encouraging him to do his best.

Mr. SLEMP. Have you had much trouble with labor, or have you had strikes?

Col. TRIPP. Yes, sir; we have an average of three or four strikes per day throughout the country. I think four is the average, but none of them is serious. We have an industrial service section, which has recently been turned over to me; but so recently that I had forgotten to mention it. It is headed by Dean Snyder, of Cincinnati, who ran a vocational school there. He is interested in economic and industrial problems, and is a very able man. When these strikes get to such a stage that the local district manager can not bring the workingmen and the employers together and have them mutually agree upon something and immediately go back to work, Dean Snyder sends some one out from his section, or has somebody already located near there, and he has been very successful in inducing the men to go back to work and having the difficulties settled afterwards. These men are in uniform, and that carries considerable weight with the workingmen. We have been very successful in having the difficulties laid by and having the men go back to work, in most cases having the men and the employers to harmoniously agree to settle the difficulties afterwards. Where they agree to settle the difficulties afterwards we try to fix a fair adjustment down here. Theoretically, Dean Snyder's section ought not to be considered as a part of the production division. It has been made a part of the production division reporting to me, and I have so considered it, but the tendency of our district managers would be to represent the manufacturers. Therefore, we have to have a body that is somewhat in the position of representing the men in order to accomplish anything purely as a matter of labor politics, because if the men ever get the idea that every effort is being made by the production division to fight the battles of the employers for them, we would not get anywhere. Therefore we make every endeavor to make Dean Snyder's section absolutely independent, and we rather look on it ourselves as representing the labor side of it.

Mr. SLEMP. Does the work of your department involve also the securing of raw materials for plants?

Col. TRIPP. Yes, sir; and we have quite a tremendous problem in the moving of raw materials and component parts, which belong to the Government and are paid for under the cost-plus contracts, from one place to another. One serious problem confronting us is the manufacturer having a cost-plus contract under which the Government is to deliver either component parts or raw material. It is simply human nature for him to sit back and say, "You deliver us the goods, and we will do the work." Therefore, we have in the department of plant facilities, a department which is in charge of a very energetic man who does not do anything else but see that the material is moved about in cooperation with officers having charge of the particular work. It is a very important part of our work. It has a great deal to do with production, and our district managers are also fully alive to that weakness and are following it up.

Mr. BORLAND. What do you call the district manager? Is he an officer of your department?

Col. TRIPP. He is an employee of the production division. He is a civilian and has charge of a certain area geographically described. All of the questions regarding contracts in that division pass through him, and from the contractor through the district manager to us. He has a force attached to him under his orders, who are placed in those factories to follow production. They are either placed in the factory all the time, if it is a large factory requiring it, or they travel from one factory to another, visiting them daily, semiweekly, or weekly, as seems wise.

Mr. BORLAND. You have the country districted for that purpose?

Col. TRIPP. Yes, sir.

Mr. BORLAND. How many districts have you?

Col. TRIPP. Ten. The district headquarters are at Boston, Bridgeport, New York, Rochester, Cleveland, Chicago, Detroit, Cincinnati, Pittsburgh, and Philadelphia.

Mr. BORLAND. Are those district managers civilian employees?

Col. TRIPP. Yes, sir.

Mr. BORLAND. What is the grade of their salaries?

Col. TRIPP. $4,000 each. I insisted on paying those men salaries. All of them would probably have come and worked for $1 a year; but a $1-a-year man is not a very good employee, even though he thinks he is. These men use up their $4,000 in traveling expenses and in paying the salaries of assistants who can not afford to come for the salaries that we can pay under the civil-service rules, and I venture to say that in every case not a single man retains any of his $4,000.

Mr. BORLAND. What class of men are they?

Col. TRIPP. I will give you their names. The Boston manager is Levi Greenwood. He is a man of considerable property, and he is a director in many industrial concerns, the principal one, I recall to mind now, being the Wakefield Bros. He is a well-known man in eastern Massachusetts, and is a man of ability. I think he is 50 years of age. In the Bridgeport district the manager is W. C. Bryant, president of the Bryant Electric Co. Mr. Bryant is a man who started with $1,000 and built up his own quite extensive works.

He is well known in the small-arms districts, which is his district. He is experienced in manufacturing things of a character that would fit him for that kind of manufacture. He is experienced in quantity production of comparatively small things. In New York we have Mr. Samuel G. Allen, who is president of the Lima Locomotive Works, of Lima, Ohio, and vice president or chairman of the board of the Franklin Railroad Supply Co., and of some other companies, of which I do not now recall the names. He was educated as a lawyer, but he did not practice law very long before he went into business for himself. He has administrative ability of a rather high order rather than executive experience in manufacturing. In Rochester we have Mr. F. S. Noble, who had charge of the commercial end of the business of the Eastman Kodak Co. He, however, graduated into that through the shops. He was Mr. Eastman's right-hand man, and his choice was unanimously and enthusiastically approved by the whole community up there, because they felt that Mr. Noble was a man of exceedingly high caliber and of great ability.

In Cleveland, we have Mr. Samuel Scovill, who resigned from the position of president of the Cleveland Illuminating Co., a big lighting company at Cleveland, to take the position of district manager. He is also very well known in Cleveland and in that whole district. In Chicago we have Mr. E. A. Russell, who is vice president of the Otis Elevator Co. He is a man of large experience in manufacturing, and is devoting his entire time to this work. That is also true of the other men, and they are all devoting their entire time to the work. There is no division of time, except that they may in the evenings look after their own affairs, but that is all. In Detroit we have Mr. F. S. Robinson, of the Lowry & Robinson Lumber Co. He is most energetic, and is a clean-cut business man. I think I am safe in saying that a better selection could hardly have been made in that community than he. He knows the district thoroughly, and is a very practical hard-headed business man. In Cincinnati we have Mr. C. L. Harrison, whose principal business has been that of managing his father's estate since his father's death. He incidentally became interested in many industries in which his father had investments, among others the Barney-Smith Car Co., which he operated as receiver for a considerable time. He is notably a man of very sound judgment, and is regarded in Cincinnati as one of the leading men. In Pittsburgh we have Mr. Ralph Draylin, of Drylin Bros., who are builders of steel mills, bridges, and other large and heavy works. Mr. Draylin devotes his entire time to the business, as the others do, and his brother runs the firm's business. In Philadelphia we have Mr. John C. Jones, president of the Harrison Safety Boiler Works. He is also a man who has made a success in his own business, and he has unusual kinds of ability. I think I have named 10, and I feel safe in saying that they are men of unusually high ability.

Mr. BORLAND. Do I understand that contracts that are proposed to be made in those various districts are submitted to those men in the course of their preparation?

Col. TRIPP. That is not done yet, but I think it ought to be.

Mr. BORLAND. The contracts come from the Procurement Division?

Col. TRIPP. Yes, sir.

Mr. **Borland**. What is the function performed by these men?

Col. **Tripp**. They do not know anything about those contracts until they receive them.

Mr. **Borland**. They visit the factories and report upon the stages of production?

Col. **Tripp**. Yes, sir. They have their organization, and are in constant touch with it. They visit the factories, settle labor troubles, settle fuel troubles, move component parts around, and do many things of that character. They do anything that you can imagine that has to do with production. I said that they had nothing to do with placing contracts, but I am informed that a system, of which I heartily aprove, is already in existence whereby they are consulted as to the capability of plants and organizations to do work in their districts. We recommend to the procurement division that they give the order, or rather approve the proposals that they give somebody an order.

Mr. **Borland**. How does this plan fit in with the new proposed plan in charge of Mr. Charles Otis?

Col. **Tripp**. It fits in very well. Mr. Otis proposes to organize the industries in practically the same districts that we now occupy, heading them up to some chairman. I am glad to know this has been thoroughly instituted, because I have been trying to get it done for some time. For example, when the procurement division wishes to place an order in the Cleveland district, the organization which Mr. Otis sets up can say to the procurement division, "In our opinion a certain company can do that work satisfactorily." That would not be sufficient for the procurement division, however, until our manager had said that he had investigated that plant, and, as representing the Ordnance Department, he concurred in the opinion of the manufacturer's agent.

Mr. **Borland**. That report on the capacity of the factory is made by your district manager?

Col. **Tripp**. Yes, sir.

Mr. **Borland**. Do you send any of the officers of your division out there in inspect the plant, its machinery, facilities, etc.?

Col. **Tripp**. No, sir; we shall not do that hereafter, because the officers in charge of the districts are just as capable of doing that.

Mr. **Borland**. Has that been done in the past?

Col. **Tripp**. That has been the plan.

Mr. **Borland**. That was the original plan?

Col. **Tripp**. It was not the original plan; that was my plan, because I thought the work was too much centralized.

Mr. **Borland**. That work of reporting upon the capacity of the plants is done by your district managers?

Col. **Tripp**. Yes, sir.

Mr. **Borland**. And the work of getting plants up to the point of asking for Government work is done by the Otis organization?

Col. **Tripp**. Yes, sir.

Mr. **Borland**. In other words, as I understand it, if you were required to place an order for so many thousand of a certain article, you might find that there was capacity for so many hundred in Cleveland, so many hundred at Detroit, and so many hundred at Pittsburgh?

Col. **Tripp**. Yes, sir.

Mr. **Borland.** Then, having the reports on the capacity of the various plants to do the work before you, you would send the district manager to see about it, and, according to his judgment——

Col. **Tripp** (interposing). Yes, sir; and we would rely on his judgment. Mr. Otis's plan is a very excellent one. It requires of the Government a special man in the Ordnance Department, and all the other agencies will be centralized in the War Industries Board. There will be a notice that will be served on Mr. Otis's organization that the Government wants something. Then we get ready to investigate where we can place that order for the Ordnance Department, and about the same time the War Industries Board ought to have started the other machine working, so that our wants and their desire to serve the Government will meet at about the same time. I think it is an excellent idea.

Mr. **Borland.** Is the Navy cooperating under that Otis plan?

Col. **Tripp.** Yes, sir; he is working with the War Industries Board, and the requirements of the whole Government will go there. That is where Mr. Otis will be in touch with the requirements.

Mr. **Borland.** The Navy continues to advertise in the Official Bulletin its own wants. It is the only department of the Government that uses the Official Bulletin in advertising its wants. Every once in a while the Navy publishes in that Official Bulletin a list of its wants.

Col. **Tripp.** I am just ignorant enough not to know what the Official Bulletin is.

Mr. **Slemp.** In what division do you place the South, as a general proposition?

Col. **Tripp.** We started to leave the South and the extreme West to be handled from Washington, because we thought there would be comparatively few manufacturers there, but without any effort on our part it has worked out in such a way that the South has drifted into the Cincinnati district and the West into the Chicago district. We are now confronted with the proposition of establishing an office at St. Louis, and there is a great pressure brought to bear upon us to do that, and another one for the South.

Mr. **Slemp.** Of course there might be some manufacturers in either one of those sections that might be in a position to do work on account of favorable labor conditions or some other conditions that might be overlooked.

Col. **Tripp.** To do this thing right, we must decide where these matters should be centered. I might add, so that you can get a little better idea of it, that the production division is not alone in those districts, because the financial division has established itself there, and also the inspection division, so that the bills are paid locally and the inspection service is also there. But those two sections are entirely independent of the production division.

Mr. **Good.** Colonel, I take it from what you have stated here that you are keeping very close supervision over the execution of all these contracts to see that production is kept up to what has been contemplated as required?

Col. **Tripp.** Yes, sir.

Mr. **Good.** Is your organization carried to the point so that if there is to be a shortage in any of the requisite parts you will be notified in time so that the defect can be remedied?

Col. Tripp. Oh, yes; that is one of the things we do very carefully. We are after the low point all the time.

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Monday, *June 3, 1918.*

PRODUCTION OF ORDNANCE MATÉRIEL.

STATEMENT OF MR. EDWARD R. STETTINIUS, SECOND ASSISTANT SECRETARY OF WAR.

Mr. Borland. Mr. Stettinius, you are Assistant Secretary of War?

Mr. Stettinius. Second Assistant.

Mr. Borland. How long have you been such?

Mr. Stettinius. I think, about five or six weeks; I can not give you the exact date.

Mr. Borland. Long enough to familiarize yourself with the production end of the department?

Mr. Stettinius. Of ordnance. I have been giving all of my attention to the production of ordnance, but I would not say I have familiarized myself with all the details of it.

Mr. Borland. The particular jurisdiction of your office is over the production end of the Ordnance Department?

Mr. Stettinius. While my duties have not been specifically defined as yet, Mr. Baker has asked me to give particular attention to that work and that is what I have been doing, but my duties have not been specifically defined by order.

Mr. BORLAND. Your duties have not been particularly defined?

Mr. STETTINIUS. No, sir.

Mr. BORLAND. But at the request of the Secretary of War you have been giving your attention to that matter.

Mr. STETTINIUS. Yes, sir.

Mr. BORLAND. The original estimates sent in for this bill were based, as I understand, upon a program of the ordnance necessary for the forces in the field as submitted by Gen. Pershing, and approved by the department. Within the last few weeks, supplemental estimates have come in which have practically doubled that program. Did that matter come before you for approval?

Mr. STETTINIUS. No, sir; that would not come before me at all.

Mr. BORLAND. Are you charged with the duty of corelating the production end of it so as to meet that program?

Mr. STETTINIUS. I am charged with the duty, I understand, of accelerating production to the end that the earliest possible deliveries can be made of the matériel required by the program laid down from time to time.

Mr. BORLAND. The object of my question is this: We have examined in detail the heads of these various divisions of the Ordnance Department. The division of duties is such that no one man and no one office can keep in complete touch with the entire military program of the department so as to make it fit into the particular work he is doing; in other words, he gets his orders from the Chief of Staff, from your office, or from some other source.

Mr. STETTINIUS. From the Chief of Staff.

Mr. BORLAND. And the purpose of the committee in calling you was to ascertain whether you were the channel through which that program was parceled out and carried out.

Mr. STETTINIUS. No; that program is issued by the Operations Division of the General Staff and sent to the various divisions.

Mr. BORLAND. Who is that?

Mr. STETTINIUS. Gen. Jervey. I think that data is prepared by him under Gen. March's instructions.

Mr. BORLAND. And Gen. March is the Chief of Staff?

Mr. STETTINIUS. Yes, sir.

Mr. BORLAND. What has been your connection with the production end of the Ordnance Department?

Mr. STETTINIUS. Keeping in touch with the Chief of Ordnance, and, through him, with the Chief of the Production Division, advising regarding organization and personnel and receiving reports from time to time of progress of work, and suggesting ways and means by which production can be accelerated.

Mr. BORLAND. Does the Chief of the Production Division report directly to you?

Mr. STETTINIUS. No; he reports to the Chief of Ordnance.

Mr. BORLAND. And the Chief of Ordnance reports to you?

Mr. STETTINIUS. Yes, sir.

Mr. BORLAND. Are you able to advise the committee, Mr. Stettinius, to what extent the program as outlined by the Ordnance Department can be carried out?

Mr. STETTINIUS. Under the terms of the appropriations you are now considering?

Mr. BORLAND. Yes.

Mr. STETTINIUS. No; I can not. I have not seen the details of them, and never even saw a statement of them until this morning when I received your message, asking me to appear before you.

Mr. BORLAND. You have never been over these estimates?

Mr. STETTINIUS. No, sir.

Mr. BORLAND. From what particular officer did these estimates emanate? Of course, they were originally drafted in the Ordnance Department.

Mr. STETTINIUS. I assume—I do not know anything about this—that they were prepared under the direction of the Chief of Ordnance.

Mr. BORLAND. They were transmitted, then, to the office of the Secretary of War?

Mr. STETTINIUS. Yes, sir; they must have been sent to Mr. Baker's office and Mr. Baker must have gone over them with Gen. March, I think.

Mr. BORLAND. The impression I had was that as to ordnance, and particularly production of ordnance, you were in charge.

Mr. STETTINIUS. No; I am in charge only to the extent of accelerating production, and devising ways and means to improve deliveries.

Mr. BORLAND. I am afraid you are not able to give the committee very much information?

Mr. STETTINIUS. I am afraid not, sir.

WEDNESDAY, JUNE 5, 1918.

PRICE OF SMALL-ARMS POWDER.

ADDITIONAL STATEMENT OF COL. W. C. SPRUANCE.

Mr. BORLAND. The current law contains the following clause:

> That appropriations in this act shall not be expended for powder other than small-arms powder at a price in excess of 53 cents a pound.

The recommendation now is that that language be dropped from the present bill. What is the department's reason for recommending that that language be omitted.

Col. SPRUANCE. That is the act of February 14, 1917?

Mr. BORLAND. Yes.

Col. SPRUANCE. While the fortification act of February 14, 1917, provides in section 4 that in the expenditure of the funds appropriated by this act a price in excess of 53 cents per pound shall not be paid for smokeless powder, other than smokeless powder for small arms, it should be noted that the urgent deficiency acts of March 28, June 15, and October 6, 1917, did not contain this or any similar provision as applied to the moneys made available by these three acts. The developments subsequent to the passing of the fortification act of February 14, 1917, showed clearly that in order to develop the maximum production of smokeless powder in the United States in the shortest time and at the lowest ultimate cost, including the outlay for new plant facilities, cases would, in all probability, arise in which the best interests of the Government would be served by paying more than 53 cents per pound for smokeless powder, due to such items as increased cost of labor and materials, inefficient methods or equipment of the smaller manufacturers, etc.

It was therefore felt, and it is still believed to be true, that if the limiting condition before referred to should apply to the expenditure of moneys made available under this bill the best interests of the Government can not be served. While it is true that by far the major portion of the smokeless powder required will be secured at a net cost to the Government, exclusive of plant amortization, appreciably below 53 cents per pound, this figure may not be maintained if the cost of raw materials and labor increase, or if amortization of plant, corrected for depreciation, is included in calculating net price or cost of the finished product to the Government. Therefore, while every effort, of course, is being and will be made to provide the smokeless powder at the lowest prossible cost to the Government, the foregoing and other conditions, and war-time uncertainties, prompt the Ordnance Department to urge that following the precedent established by the urgent deficiency acts of March 28, June 15, and October 6, 1917, no provision limiting the price to be paid for smokeless powder should be included in the 1919 fortifications act.

WEDNESDAY, JUNE 5, 1918.

RENT IN WASHINGTON, D. C.

ADDITIONAL STATEMENT OF COL. J. B. DILLARD.

Mr. BORLAND. I want to ask you about section 3:

> That not to exceed $30,000 of the funds appropriated by this act for the armament of fortifications may be expended for the rental of suitable space in Washington, D. C., or for the alteration or repair of any building owned by the Government, for the use of the drafting force of the office of the Chief of Ordnance engaged in the design of material appropriated for in this and other acts.

What is the condition of your rental space?

Col. DILLARD. I have been unable to find anybody in the office of the Chief of Ordnance who knows about the insertion of that clause. It originated in the act of July 6, 1916, when we were occupying space in the War Department building and had to have more room. By that act we were authorized to rent space outside of the War Department building, which we did. We almost immediately outgrew that building, and we were authorized to enter into a lease of not to exceed five years, and to get a new building erected for our use, which was done, at Eighteenth and E Streets. That was before the war. When the war broke out we immediately overflowed from that building, just as everyone did. But we are still occupying that building at Eighteenth and E Streets—that is, the Ordnance Department is—for draftsmen, which is what this money was originally intended for.

The new building now being erected in Seaton Park, this fireproof building, will take care of our force of draftsmen for the present, at least, so that this rental money is not needed for the purposes of the Ordnance Department. I got in communication with the Secretary's office and find that they desire to continue to lease that building, which is at a very reasonable price, and Mr. Dorr, who is handling those matters in the office of the Secretary, told me that no money, through oversight or otherwise, had been included for that in the military bill. He asked me to try to see that this appropriation was continued in this bill, in order to pay the rent of that building, on which we have a five-year lease.

Mr. **Borland**. The current law provides:

> *Provided*, That the Chief of Ordnance is authorized, in his discretion, to enter into a contract for the lease of such suitable space for a period not to exceed five years, at an annual rental not to exceed $15,000.

Col. **Dillard**. Yes, sir.

Mr. **Borland**. That is in the current law, and you have entered into a lease?

Col. **Dillard**. Yes; for five years.

Mr. **Borland**. You have authority to enter into it?

Col. **Dillard**. Yes, sir.

Mr. **Borland**. So you are not suffering any default there, are you?

Col. **Dillard**. No, sir. But when the war came on we had some additional funds appropriated in the act of October 6, 1917, $11,000, for the Ordnance Department, and we had three stories added to that building. It was originally erected as a six-story building, on which we had a five-year lease; we had three stories added to that building, which we rent from year to year.

Mr. **Borland**. Where is it?

Col. **Dillard**. It is at Eighteenth and E Streets. So that we now have a nine-story building at Eighteenth and E Streets; on the lower six floors we have a five-year lease, and on the three upper stories we have a year-to-year lease at the same rate, and there is required to pay that rental $22,500 a year.

Mr. **Borland**. When this new building is finished in Seaton Park you will abandon these premises?

Col. **Dillard**. Yes, sir; we will not require that building any more for the Ordnance Department, and we expect to move out next week. So the Ordnance Department does not require these funds.

Mr. **Borland**. I understood you to say that you wanted authority to continue the lease which has been made?

Col. **Dillard**. The Secretary's office does.

Mr. **Borland**. They want it for something else?

Col. **Dillard**. Yes; for something else other than the uses of the Ordnance Department.

Mr. **Borland**. The Ordnance Department has no need for it?

Col. **Dillard**. No, sir.

Mr. **Borland**. Then, it does not belong in this particular bill. If the Secretary wants it, he will estimate for it under some other head.

Col. **Dillard**. The difficulty is that the Secretary's office has not any money with which to pay the rent on that building; that is what is bothering them.

Mr. **Borland**. We just passed a deficiency bill for them.

Mr. **Byrns**. And there will be another one before the session is over.

Mr. **Borland**. Do you know anything about the cutting out of the clause in regard to the 25 per cent limitation above the cost of manufacture in the arsenals?

Col. **Dillard**. I knew it was in the bill, but I do not know anything in detail about it.

WEDNESDAY, JUNE 5, 1918.

PURCHASE OF GUNS FROM NAVY.

(See pp. 215, 315, 320.)

STATEMENT OF REAR ADMIRAL RALPH EARLE, CHIEF BUREAU OF ORDNANCE, NAVY DEPARTMENT.

Mr. BORLAND. Admiral, you are the Chief of Ordnance of the Navy Department?

Admiral EARLE. Yes, sir.

Mr. BORLAND. Some question was raised here in regard to an estimate for guns to be purchased from the Navy Department for the armament of fortifications. In this bill there appears an estimate of $2,197,000 for guns purchased or to be purchased from the Navy Department. That estimate does not appear in the book, but it is in a list furnished the committee. What guns are those that are contemplated to be sold?

Admiral EARLE. The guns already given to the Army are fourteen 8-inch, .35-caliber guns, at $14,000 each; eight 10-inch, .30-caliber guns, at $25,000 each; two 8-inch, .40-caliber guns, at $14,000 each; two 12-inch, .35-caliber guns; two 12-inch, .40-caliber guns, at $40,000, or four guns at $40,000 each; forty-seven 6-inch guns, at $5,000 each; four additional 8-inch guns, at $14,000 each; and two more 12-inch, .35-caliber guns, at $40,000 each. Those figures represent the cost as transferred to the Army and not the actual cost of the guns to the Navy. Those figures are made as a result of a survey, and considering what work the Army would have to put on the guns. They have been invoiced to the Army at those prices.

Mr. BORLAND. Let me understand that: How did you arrive at those prices?

Admiral EARLE. That is by figuring the depreciation.

Mr. BORLAND. Who made the estimate?

Admiral EARLE. We made the estimate in the Bureau of Ordnance.

Mr. BORLAND. The Bureau of Ordnance of the Navy Department?

Admiral EARLE. Yes, sir.

Mr. BORLAND. Was it in conjunction with officers of the Ordnance Department of the Army?

Admiral EARLE. Yes, sir; it was taken up with them. There was a letter from the Secretary of the Navy to the Secretary of War giving those values that I have just given you.

Mr. BORLAND. You fixed the values?

Admiral EARLE. Yes, sir.

Mr. BORLAND. And you said they could purchase the guns at those prices?

Admiral EARLE. Yes, sir. We have delivered the guns under a transfer of funds from the appropriation "Armament of fortifications" to "Ordnance and ordnance stores of the Navy."

Mr. BORLAND. How was that done?

Admiral EARLE. It was to be a transfer of funds from the appropriation "Armament of fortifications" to the appropriation "Ordnance and ordnance stores of the Navy."

Mr. BORLAND. Am I to understand that the guns have already been delivered?

Admiral EARLE. All that I have mentioned have been delivered.

Mr. BORLAND. Does that comprise the full list?

Admiral EARLE. No, sir. There are to be delivered, instructi not having been received definitely, forty-four 14-inch .50-calib guns. They are our heavy naval guns, and the cost of them we ha not definitely given the Army, but it will be about $87,500, which the actual cost of the fabrication of that gun in the Naval G Factory, exclusive of breech mechanisms and mountings.

Mr. BORLAND. Did you say there were 44?

Admiral EARLE. Yes, sir; 44.

Mr. BORLAND. Fourteen-inch guns?

Admiral EARLE. Yes, sir; the 14-inch .50 caliber gun is our bigg naval gun.

Mr. BORLAND. And they were valued at $87,500 each?

Admiral EARLE. Yes, sir. Then there are about to be turn over twelve 7-inch .45 caliber naval guns, that being a heavy nav gun, at $22,500 each for the guns and $14,000 each for the mount

Mr. BORLAND. What does that figure represent?

Admiral EARLE. The cost. That is, the actual cost. They a new guns.

Mr. BORLAND. Are those 44 guns new guns?

Admiral EARLE. Yes, sir; they are new guns.

Mr. BORLAND. How about the rest of them?

Admiral EARLE. The rest of the guns are of various ages. Th run all the way from about 1892 or 1893 up to last year.

Mr. BORLAND. How does it happen that you have those surpl guns to dispose of to the Ordnance Department of the Army?

Admiral EARLE. These include some of our reserve for the fle We hold a certain number of guns in reserve, and we thought we h better turn these over to the Army, as the Army expressed a desi to use them immediately on the front, and we thought, judging fr the experience of the British Navy in this war, that we would n need them before others could be fabricated to replace them.

Mr. BORLAND. These guns are not taken from the equipment any particular ship?

Admiral EARLE. No, sir.

Mr. BORLAND. You say that this program of guns was agre upon. Was it in response——

Admiral EARLE (interposing). It was in response to a reque from the Army that we give them all the guns we could spare.

Mr. BORLAND. Did they designate the list of guns, or did you sele the list of guns?

Admiral EARLE. No, sir; they asked what we had.

Mr. BORLAND. And you gave them what you could?

Admiral EARLE. Yes, sir.

Mr. BORLAND. Is this to be the limit of your ability to suppl them?

Admiral EARLE. That is practically our limit, unless we go ahea with standard naval gun manufacture, of which there is no immediate prospect of our doing.

Mr. BORLAND. Admiral, do you want this in the form of an appr priation, or simply in the form of legislative authority for the transf of those guns?

Admiral EARLE. I think it is just authority that we want.

Mr. BORLAND. It is just authority that you need?

Admiral EARLE. Yes, sir.

Mr. BORLAND. An appropriation, of course, has already once been made for those guns in the form of law out of the Federal Treasury, and if we made it it would really be a second appropriation for the same guns.

Admiral EARLE. Yes, sir. In making our estimates for 1919, however, we considered we had an amount equal to the sale price of these guns for new guns, and will be short in funds if not reimbursed.

Mr. BORLAND. I take it that what you would need would be legislative authority to make the transfer.

Admiral EARLE. Yes, sir.

Mr. BORLAND. Admiral, let me ask you about some specific guns. You have mentioned forty-seven 6-inch guns, at $5,000 each. What was the condition of those guns? Were they in good condition?

Admiral EARLE. Some of them were in excellent condition and some of them were not so good. Now, a large portion of the 6-inch guns were the short 6-inch guns dating back to about 1892, and in order to make them suitable for the Army's use it will be necessary to remodel the breech mechanism, which has to be done in the Army arsenals.

Mr. BORLAND. And you allowed for that in the price?

Admiral EARLE. Yes, sir.

Mr. BORLAND. You estimated a lower price on that account?

Admiral EARLE. Yes, sir.

Mr. BORLAND. It appears that the Army has under contract thirty 6-inch naval guns from a dealer in naval stores by the name of Bannerman.

Admiral EARLE. Yes, sir.

Mr. BORLAND. Do you know anything about those particular guns?

Admiral EARLE. Yes, sir; those guns were taken from cruisers of the *Newark* type. Those are 6-inch .30-caliber guns. Mr. Bannerman has gathered together from year to year a motly collection of ordnance, some of it good and some of it not very good, but all of it a little out of date and he has now come to the force with a proposition to sell those guns. Those particular 6-inch .30-caliber guns would be of no value to the Navy, because they are of too low velocity and are of too short a range, but they are certainly good for field work, or for anything that does not require extreme range, which would be the case so far as fighting in the trenches is concerned. Those 6-inch guns are of some value on shore to be used against trenches and against troops, but they would be of no value on board ships.

Mr. BORLAND. It is the custom of the Navy to sell obselete guns?

Admiral EARLE. Those guns were so sold.

Mr. BORLAND. How long ago?

Admiral EARLE. I do not think I have the date.

Mr. BORLAND. Do you have a record of the price at which they were sold?

Admiral EARLE. I will be glad to give you both. I will put that information in the hearing.

NOTE.—On March 28, 1913, Francis Bannerman, of New York, purchased eighteen 6-inch 30-caliber guns. The price paid for these guns was based on weight of steel and ranged from 53 cents to 71 cents a hundred pounds and, in the case of 11 of the guns, from $12.66 a gross ton to $13.02 a gross ton. The total weight of the guns sold to Mr. Bannerman, including the foregoing, as well as two 8-inch guns was 246,914 pounds. In other words, the price paid by Mr. Bannerman for 6-inch 30-caliber guns was in the neighborhood of $78.67. This was bought by him as scrap value only.

The Luria Bros., of Reading, Pa., on May 14, 1914, purchased 12 other ob 6-inch guns at a total price of $2,386.88. It is quite probable that Mr. Bannerma did purchase these guns from the Luria Bros., although the department has no rec as to such a transaction. The guns in the latter case were purchased for less th $200 a piece.

Mr. BORLAND. What is the actual cost of manufacturing 6-in guns of that type?

Admiral EARLE. The cost was $5,999.50 in 1892.

Mr. BORLAND. Practically $6,000.

Admiral EARLE. Yes, sir.

Mr. BORLAND. And they are of a type no longer used?

Admiral EARLE. Not on naval vessels. They must have bee sold at a very much reduced price because they were surveyed a obsolete.

Mr. BORLAND. I take it that you do not sell anything that is no obsolete.

Admiral EARLE. No, sir.

Mr. EAGAN. They were obsolete so far as the Navy is concerned

Admiral EARLE. Yes, sir; but for land warfare they would b very good at short range, as large shells thrown comparatively litt distance are effective.

MONDAY, JUNE 3, 1918.

BOARD OF ORDNANCE AND FORTIFICATION.

STATEMENT OF LIEUT. COL. J. M. WRIGHT, CORPS OF ENGINEERS, RECORDER OF THE BOARD OF ORDNANCE AND FORTIFICATION.

Mr. BORLAND. Colonel, the appropriation for the Board of Ordnance and Fortification for 1918 was $150,000. What is the stat of your balances under that?

Col. WRIGHT. At the commencement of the fiscal year 1918 the board had a total available balance of $278,440.94. That balanc included last year's appropriation of $150,000. The remainder o the sum had accumulated from appropriations made in previou years. From that balance allotments have been made up to June 3, 1918, aggregating $110,675, and a withdrawal of the balance o a previous allotment amounting to $3.25 has been made, making the net available balance at the present time $167,769.19.

Mr. BORLAND. Upon what theory are they asking $150,000 thi year?

Col. WRIGHT. The request for additional money is of course based on the idea that the expenditures of the board are variable in their amounts. They depend entirely upon the number of meritorious inventions that may be presented to the board, and that, of course, is not a thing that can be accurately ascertained in advance. The amount of money which is necessary for the development of a given invention is also a variable quantity.

For example, in the past year we have allotted a total of about $110,000. Of that $110,000 $70,000 went on a single invention. You can very readily see that if we had happened to find two or three inventions of that kind instead of only the one, a balance even f the size we have, which is in excess of the amount we have estimated for, would go very rapidly.

Mr. **Borland**. Colonel, you are the secretary of the board?

Col. **Wright**. The recorder; yes, sir.

Mr. **Borland**. Does the board have power to advance money to perfect inventions?

Col. **Wright**. Yes, sir; I think you will find the term "development of inventions" used in the appropriation estimates and in previous appropriations.

Mr. **Slemp**. Your theory is to keep on hand about twice as much money as you have normally been using?

Col. **Wright**. I would not say the theory has been that. The appropriations have apparently been made in the past with the idea of permitting us to do that.

Mr. **Borland**. Do you find that an increasing number of inventions are submitted during a war?

Col. **Wright**. The number of inventions that have been received by the War Department has increased very greatly as a result of the war, until at the present time I fancy they will reach an average of 80 or 90 per day. Previous to the war we would not get that many in six months.

Mr. **Borland**. What do you do with the bulk of those inventions—ust have some officer pass on them formally and discard them?

Col. **Wright**. I will explain to the committee the system which s in effect in the War Department at the present time. This system I may say has gone into effect within the last month. There is established in the General Staff an Inventions Section, which has ts offices in the Army War College Building at Washington Barracks. This Inventions Section is under the control of an officer detailed for that purpose from the General Staff, and has associated with it in its work a number of reserve officers of scientific attainments. In selecting these officers an effort has been made to represent all branches of the service. The Inventions Section is also in touch with the leading scientific thought of the country. Present orders n the War Department direct that all inventions received in any office in the department are to be sent to this Inventions Section.

In the Inventions Section they receive their preliminary inspection, and those inventions which appear to the section to be worthy of further development are referred to some body, such as the Board of Ordnance and Fortification, the National Research Council, the Bureau of Standards, or a bureau of the department itself, for further nvestigation, and, if justified, further development. The Board of Ordnance and Fortification is particularly mentioned in this connection, because it is the one organization in the War Department itself which is supplied with funds for the development of inventions.

Mr. **Byrnes**. Colonel, just what expenses might possibly be involved in such development? Does that mean the payment of any sum to the inventor, or would it simply mean the preparing of a model of the proposed invention? In other words, I want to know whether it means that if a man was to offer an invention and wanted to be paid for it, he would receive some sum by way of compensation for turning it over to the Government?

Col. **Wright**. That depends entirely upon the conditions wh may arise in each individual case. If possible the terms upon wh an invention may be secured are learned before it is even presen to the board. If this is not possible the board may proceed w the development and test of promising inventions and will barg for their use only after they have proved to be of real worth. In a few cases special appropriations have been requested from Congr for the purchase of valuable inventions.

Mr. **Borland**. Colonel, just what is the modus operandi of a inventor, an ordinary citizen, in getting his invention before t board?

Col. **Wright**. At the present time his invention would be, in a probability, sent to some bureau of the War Department or to t Secretary of War himself. It would be referred by the Secretary by that bureau to the Inventions Section of the General Staff. T Inventions Section of the General Staff would look over the invent and decide whether or not it had merit in its present form or wheth it was capable of development into a form which would be merito ous. In case it did appear to have possibilities, the Inventions S tion of the General Staff would refer it to some one of these agen which I have named, the National Research Council, the Bureau Standards, the Board of Ordnance and Fortification, or perha some bureau of the War Department, whose specialty was along t line of this particular invention, with instructions that the inventi was to be followed up and attempts made to make something out it that would really be useful to the War Department. In case t invention is not considered meritorious the inventor will be notif of the fact that his ideas do not possess sufficient military value justify the United States in expending money in their developme

Mr. **Slemp**. Do you have a contract with the inventor as to wha he will charge for his invention in case the invention is accepted b the Government?

Col. **Wright**. That point is always taken into consideration befo determining on the making of an allotment for the development of t invention.

Mr. **Byrns**. This fund, however, is not used for the purpose of co pensating any inventor or anything of that sort?

Col. **Wright**. No, sir.

Mr. **Eagan**. Are these inventors paid for such time as they put i in connection with their inventions?

Col. **Wright**. Not unless there is some particular method of doin so specified in connection with the allotment. For example, we hav an allotment out now of $2,500 for the development of a semiaut matic rifle. This rifle was invented by an Italian living in St. Lou and the Ordnance Department think that it offers possibilities. W have allotted $2,500 to the Ordnance Department for the purpose o constructing a rifle after this model with improvements, and we hav directed the Ordnance Department to utilize just as far as possible the inventor's services in the development of this rifle, with the idea of incorporating new ideas which he may have, and also with the idea that by submitting the invention he has become entitled to consideration in this way.

PROVING GROUND FACILITIES.

[See p. 153.]

ABERDEEN, MD.

Mr. Borland. There is a supplemental estimate here of $6,300,000 for proving ground facilities.

Col. Dillard. That is all for Aberdeen proving ground, or at least we intend it all to be for Aberdeen. There are two items in there, one of $1,300,000 and one of $5,000,000. When these estimates were put in the $1,300,000 was intended to be for the Savannah proving ground, which is near the Rock Island Arsenal, about 6 miles north of Rock Island, and $5,000,000 was intended to be for Aberdeen. Now, the Savannah proving ground was laid out before the war, and, due to the fact that we are manufacturing in that neighborhood especially more powerful shells and more powerful guns than we expected to use that proving ground for, the proving ground has lost some of its importance, and also, due to the fact that we are having numerous temporary proving grounds located near manufacturing centers, we have less need for the Savannah proving ground at the present time.

Mr. Borland. You will need it for field artillery of the ordinary sort that is manufactured at Rock Island, Chicago, and in that vicinity?

Col. Dillard. Yes, sir; we intend to use it for that.

Mr. Borland. But not for large shell?

Col. Dillard. No, sir. What we intend to do is to try to get along and simply use the money that we had originally appropriated for that proving ground, namely $1,500,000, and instead of putting in any permanent construction whatever, to build simply the most temporary shacks there, because we find that to get quantities of guns, carriages, and ammunition to the proving ground will take time and the freight bills will be large. So we will abandon the idea of having anything permanent, or even semipermanent there for the time being. Now, we have found that the $5,000,000 for Aberdeen is inadequate to meet the requirements, and so we want to transfer or want to use $1,300,000 for Aberdeen in addition to the $5,000,000, and, besides that, we want $2,180,000 in addition to the $6,300,000 for Aberdeen.

Mr. Borland. You estimate $5,000,000 for Aberdeen, and you want $1,300,000 more for Aberdeen?

Col. Dillard. Yes, sir.

Mr. Borland. That is, a part of the money originally intended for Savannah you want for Aberdeen?

Col. Dillard. Yes, sir; all of the $1,300,000 and moreover we require $2,180,000 in addition to that, to make Aberdeen capable of handling the necessary work that will be thrown there, which means that we want to increase that item of $6,300,000 to $8,480,000. A good part of this is due to the increase in the Army to 3,000,000 men.

Mr. Borland. What do you intend to build with that $8,000,000?

Col. Dillard. I have the detailed estimate here.

Mr. Borland. Where is all of that expense? You have machine shops on a pretty good scale, and they were provided for in a prior estimate, and you have not very much to do now, except grading, the laying out of roads, and a few odds and ends of that kind.

Col. DILLARD. Well, we will have to take them up one at a time and I have here a detailed estimate of exactly what we intend to use that for. The general items include what are generally known as overhead. That is the first item, and the cost to May 21, 1918, in the first column, is the money that has already been expended under that head.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ORDNANCE,
ENGINEERING BUREAU,
Washington, June 5, 1918.

From: The commanding officer, Aberdeen Proving Ground.
To: The Engineering Division.
(Attention Col. James B. Dillard.)
Subject: Revised estimate: Aberdeen Proving Grounds, funds for construction work to June 30, 1919.

1. In accordance with instructions from the Acting Chief of Ordnance (O. O. W. D. E. D. 121.25/142), the following estimate is submitted, divided as follows:

The first column represents the cost of all obligations up to May 21, 1918, and totals

Land commission	$3,550,000
Cost of construction and equipment	3,000,000
Total cost to May 21, 1918	6,550,000
Obligated for materials, June 5, 1918	438,766
Total cost and obligated to June 5, 1918	6,988,766

The second column covers the estimated amount of funds required up to June 30, 1918, to equip the proving ground on a temporary basis of construction, for an army of 2,000,000 men. It is based upon the latest data available and totals $7,700,000.

2. The figures are based upon making as temporary a construction as possible, which will still be serviceable for the work. For example, the machine shop will require a steel frame, on account of the heavy cranes required to handle parts up to 80 tons in weight. Also the water supply and sewage disposal systems obviously have to be of good construction. But, wherever possible, temporary construction, capable of later conversion to permanent, will be used.

The third column represents the total estimated cost up to June 30, 1918, for an army of 2,000,000 men, to which should be added the supplementary estimate of May 25, amounting to $780,000, to increase the facilities for an army of 3,000,000 men.

3. The grand totals are as follows:

	Cost to May 21, 1918.	Required to June 30, 1919.	Total cost
Land commission	$3,550,000.00		
Cost to May 21, 1918	3,000,000.00		
Total	6,550,000.00		
Obligated for materials to June 5, 1918	438,766.22		
Total allotted and cost	6,988,766.22	$7,700,000	$14,688,76
Additional for army of 3,000,000 men, estimated May 25, 1918		780,000	780,0
Total	6,988,766.22	8,480,000	15,468,76
Funds to obtain from new appropriation		8,480,000	

4. Attention is called to the fact that the daily expenditure of ammunition at Aberdeen, when firing 15,000 rounds per day, will approximate $353,125, or at the rate of $106,000,000 per year, which is approximately seven times the first cost of the proving ground. At such time as the proving ground is in condition to fire 15,000 rounds per day, there will be released for service ammunition to the value of approximately $60,000,000 daily.

In view of the enormous volumes of work to be done and the results accomplished thereby, the initial cost of the proving ground is comparatively small.

W. A. PHILLIPS,
Colonel, Ordnance, N. A., Commanding
By A. B. ROBERTS,
Captain, Ordnance, R. C.

ABERDEEN PROVING GROUND,
Aberdeen, Md., June 5, 1918.

From: The commanding officer, Aberdeen Proving Ground.
To: The Engineering Bureau.
(Attention Gen. Rice.)
Subject: Revised estimate based upon an army of 3,000,000 men instead of an army of 2,000,000 men.

1. In compliance with instructions by telephone from Gen. Rice, there is submitted herewith an estimate which is additional to the estimate submitted on May 23, 1918. The estimate of May 23, 1918, was based upon an army of 2,000,000 men. Then we will add $780,000 to the original estimate, which is only 5.3 per cent of the total cost of the proving ground, for a 50 per cent addition to the Army. This is due to the fact that a greater part of the increase is for acceptance work and bears no relation to the total amount of the work that is to be done at the proving ground.

	Officers.	Enlisted.	Civilian.
Personnel required at Aberdeen Proving Ground for an average of 12,835 rounds per day or an army of 2,000,000 men	350	3,500	1,000
Personnel required at Aberdeen Proving Ground for an average of 15,000 rounds per day or an army of 3,000,000 men	430	4,200	1,750
Increase over estimate of May 23, 1918	80	700	750

NOTE.—The housing of the above personnel is of utmost importance. Aberdeen and Havre de Grace are unable to take care of any additional personnel, and in order to obtain the proper type of skilled labor, quarters should be provided for civilian employees.

Also, quarters on the post for all officers are a necessity.

Officers' quarters for 80 officers (estimate, 32 married, 48 single):		
16 double bungalows, at $7,000	$112,000	
4 12-room bungalows for 48 officers, at $5,000	20,000	
		$132,000
Additional officers' mess, 50 by 16 feet (800 square feet, at $5.50)		4,400
Total for officers		136,400
Barracks, 700 men:		
14 barracks, 20 by 140 feet (39,000 square feet, at $2)	78,000	
4 mess halls, 90 by 40 feet (14,400 square feet, at $1.75)	26,000	
7 lavatories, 50 by 14 feet (4,900 square feet, at $1.75)	8,600	
Total for enlisted men (58,300 square feet)		112,600

Since the housing of civilian personnel has not been provided for, it will be necessary to use soldiers to a greater extent. It is recommended that some housing commission be appointed immediately to provide suitable quarters for our women employees, mechanics, machinists, and other skilledlabor.

If these quarters are not provided, it will be necessary to furnish barracks for the following soldiers:

Barracks for 750:		
15 barracks, 140 by 20, 42,000 square feet, at $2	84,000	
4 mess halls, 90 by 40, 14,400 square feet, at $1.75	26,000	
8 lavatories, 50 by 14, 5,600 square feet, at $1.75	9,800	
Total (72,000 square feet)		119,800
Total, quarters and barracks		368,800
Add miscellaneous		36,200
		405,000

PROVING GROUNDS FACILITIES.

Water battery:	
2 side traverses, at $400	$800
1 rear traverse	1,000
1 emplacement, 20 by 20 feet	1,250
1 increase platform, 20 by 30 feet, 600 square feet, at $1.25	750
Total water battery	3,800
Mobile battery platform:	
300 by 50 feet, 15,000 square feet, at $1.25	18,750
Water butt addition, 100 by 20 by 20, 1,500 cubic yards, at $16.70	25,000
Total mobile battery	43,750
Trench warfare:	
3 side traverses, at $400	1,200
1 rear traverse	1,000
2 emplacements, at $1,000	2,000
Total, trench warfare	4,200
Detonating range:	
6 side traverses, at $400	2,400
3 rear traverses, at $1,000	3,000
Total detonating range	7,400
Total P. G. facilities	59,150
Add miscellaneous	5,850
Total	65,000

MISCELLANEOUS BUILDINGS.

Increase administration building record room and for clerks and officers:	
20,000 square feet, at $2.50	50,000
Powder magazines, 3, 45 by 20, 2,700 square feet, at $1.67	4,500
Assembly sheds, 3, 100 by 40, 12,000 square feet, at $1.50	18,000
	72,500
Add miscellaneous	7,500
Total, miscellaneous buildings	80,000

SECTION XVI.

Transmission, power and light, 170 kilowatt additional, at $75	12,800
Add miscellaneous	2,200
Total transmission	15,000

SECTION XX.

Heating and ventilating, 25,000 square feet radiation, at $2.50	62,500
Add miscellaneous	6,500
Total, heating and ventilating	69,000

SECTION XXI.

Interior lighting, 200,000 square feet additional space, at $0.12	24,000
Add miscellaneous	2,000
Total, interior lighting	26,000

SECTION XXII.

Plumbing and sewers:
40 fixtures, officers.
80 fixtures, men.

120 fixtures in place, including sewer connection, at $125	$15,000
Add miscellaneous	1,500
Total plumbing	16,500

SECTION XXII-A.

Water supply, additional quarters and barracks, 2,000 feet, at $5	10,000
Add miscellaneous	1,000
Total, water supply	11,000

SECTION XXVI.

Telephones, 40 phones and connections, at $25	1,000
Add miscellaneous	100
Total telephones	1,100

SECTION XXVII.

General equipment:	
Scales, scoops	1,500
Furniture for offices, one-third increase	15,000
Total	16,500
Add miscellaneous	1,500
Total, general equipment	18,000

SUMMARY.

Additional funds required to increase the capacity of Aberdeen Proving Ground from an average of 12,000 rounds per day to 15,000 rounds per day, or equivalent to an Army of 3,000,000 men.

For additional quarters and barracks	$405,000.00
Proving-ground facilities	65,000.00
Miscellaneous buildings—administration, magazines, and assembly sheds	80,000.00
Transmission light and power	15,000.00
Heating and ventilating	69,000.00
Interior lighting	26,000.00
Plumbing and sewers	16,500.00
Water supply	11,000.00
Telephones	1,100.00
General equipment	18,000.00
Total	706,000.00
Add contingencies, extras, overhead, and contractor's profit	73,400.00
Total	780,000.00
Add total cost of proving ground for Army of 2,000,000 men, estimated May 23, 1918	14,688,766.22
Total cost of proving ground for Army of 3,000,000 men	15,468,766.22

NOTE.—The additional cost of $780,000 is an increse of 5.3 per cent.

W. A. PHILLIPS,
Colonel, Ordnance, National Army, Commanding.
By A. B. ROBERTS,
Captain, Ordnance, Reserve Corps.

ABERDEEN PROVING GROUND.

Recapitulation of classified schedule of work done, and revised estimates of funds required to June 30, 1919, to complete the proving ground on a temporary basis for army of 2,000,000 men.

Section.	Description.	Cost to May 21, 1918.	Cost to complete.	Total cost.
1	General items	$742,100.00	$636,400.00	$1,378,500.00
3	Property	3,550,000.00	200,000.00	3,750,000.00
4	Preparing site	130,000.00	93,000.00	223,000.00
5	Yard—Railroad and roads	653,350.00	1,337,000.00	1,990,350.00
7	Buildings:			
	Water battery		12,000.00	12,000.00
	Aviation field		269,050.00	269,050.00
	Other operators' buildings	730,420.00	2,037,580.00	2,768,000.00
	Contractors' buildings	135,465.00	342,535.00	478,000.00
8	Proving ground facilities	38,200.00	417,100.00	455,300.00
10	Power-plant equipment	80,160.00	81,000.00	161,160.00
16	Transmission, power, and light	58,980.00	183,020.00	242,000.00
20	Heating and ventilating	25,000.00	262,000.00	287,000.00
21	Electric lighting		92,000.00	92,000.00
22	Plumbing and sewers	61,000.00	133,000.00	194,000.00
22A	Water supply—Wells	24,000.00	225,000.00	249,000.00
	Swan Creek		265,000.00	265,000.00
23	Refrigeration	18,000.00	11,000.00	29,000.00
24	Elevators	800.00		800.00
25	Service equipment—fire protection	25,500.00	30,500.00	56,000.00
	Cranes	1,100.00	208,900.00	210,000.00
	Industrial railroad	1,000.00		1,000.00
	Sump pumps		1,000.00	1,000.00
	Trucks and trailers		29,400.00	29,400.00
	Oil and gasoline storage	2,000.00	11,400.00	13,400.00
26	Telephone, telegraph, chronograph, alarm circuits, lightning protection	90,125.00	115,600.00	205,725.00
27	General equipment	182,020.00	355,000.00	537,020.00
		6,549,200.00	7,348,485.00	13,897,687.00
	Add miscellaneous contingencies, contractor's profit		351,515.00	351,515.00
	Total	6,549,200.00	7,700,000.00	14,249,200.00
	Probable cost	6,550,000.00	7,700,000.00	14,250,000.00
	Obligated for materials June 5, 1918	438,766.22		
	Grand total	6,988,766.22	7,700,000.00	14,688,766.22

Classified schedule of work to be done by June 30, 1919, including value of work done to May 21, 1918.

Location of work.	Cost to May 21, 1918.	To complete.	Total cost.
Section 1—General items.			
Preliminary engineering	$15,000	$2,000	$17,000
Engineering—design and architecture	40,000	5,000	45,000
Drafting and blue printing	9,000	2,000	11,000
Contractor's purchasing	7,000	5,000	12,000
Labor liability insurance	25,000	75,000	100,000
Medical supplies	2,000	2,000	4,000
Field and resident engineers	13,000	17,000	30,000
Field drafting and blue printing	5,700	2,300	8,000
Field superintendence	30,000	40,000	70,000
Field clerks	70,000	90,000	160,000
Field office supplies	10,000	15,000	25,000
Engineering tests	200	100	300
Temporary hospital equipment	1,200		1,200
Construction plant	160,000	100,000	260,000
Operating plant	170,000	100,000	270,000
Tools	42,000	38,000	80,000
Watchmen	14,000	16,000	30,000
Chauffeurs	15,000		15,000
Cleaning up	1,000	4,000	5,000
Miscellaneous hauling	17,000	23,000	40,000
Transportation of labor	95,000	100,000	195,000
Total general items	742,100	636,400	1,378,500

Classified schedule of work to be done by June 30, 1919, including value of work done to May 21, 1918—Continued.

Location of work.	Cost to May 21, 1918.	To complete.	Total cost.
SECTION III.—*Property.*			
Purchase price	$3,750,000		$3,750,000
SECTION IV.—*Preparing site.*			
Clearing timber	$45,000	$20,000	65,000
Dismantling structures	2,000	3,000	5,000
Constructing sidings	10,000	30,000	40,000
Temporary roads	65,000	36,000	101,000
Temporary walks	8,000	4,000	12,000
Total	130,000	93,000	223,000
SECTION V.—*Yard.*			
Grading and backfill:			
Aviation field, 125,000 cubic yards at $0.60		75,000	75,000
Main battery, 50,000 cubic yards at $0.60		30,000	30,000
Total		105,000	105,000
Concrete roads:			
Aberdeen to Plum Point Road, 18,000×20=360,000 (40,000), at $3.50		140,000	140,000
Plum Point Road to officers' quarters, 12,300×20=246,000 (27,300), at $3.50		95,550	95,550
Detonating range road (Michaelsville), 24,000×10=240,000 (26,670), at $3		80,000	80,000
Trench warfare platform, 2,000×12=24,000 (2,667), at $3		8,000	8,000
"Y" axis to Mulberry Dock, 12,000×10=120,000 (13,335), at $3		40,000	40,000
Industrial group, 27,500, at $3		83,000	83,000
Mobile battery, 1,500×50=75,000 (8,333), at $3		25,000	25,000
Tarvia roads:			
Michaelsville to Bush River, 42,000×10=420,000 (46,700), at $2.25		105,000	105,000
Gunpowder Neck, 30,000×10=300,000 (33,300), at $2.25		75,000	75,000
Total		651,550	651,550
Permanent sidewalks: Administration building to officers' quarters, 6,000×5=30,000 (3,333), at $3		10,000	10,000
Fencing: Western boundary of reservation		12,000	12,000
Clearing and seeding:			
Aviation field, 200 acres, at $50		10,000	10,000
Parade ground, 125 acres, at $50		6,250	6,250
Industrial group, 70 acres, at $50		3,500	3,500
Total		19,750	19,750
Cinder fill:			
Main battery, 2,000×150=11,000 cubic yards, at $1		11,000	11,000
Plate range, 3,000 cubic yards, at $1		3,000	3,000
Detonating, ranges, 3,000 cubic yards, at $1		3,000	3,000
Trench warfare range, 3,000 cubic yards, at $1		3,000	3,000
Water battery, 3,000 cubic yards, at $1		3,000	3,000
Total		23,000	23,000
Railroads: Right of way—			
2,800×100=280,000 (6½ acres), at $300	1,950		1,950
13,000×50=650,000 (15, acres), at $225	3,400		3,400
Total	5,350		5,350
Waiting stations:			
At Aberdeen, 100×20=2,000, at $1.50	3,000		3,000
At proving ground (platform), 500×20=10,000 (1,100), at $3		3,300	3,300
Total	3,000	3,300	6,300
Railroad track:			
Main line, Aberdeen to Mulberry Dock, 5.7 miles, at $50,000	267,000	18,000	285,000
Aberdeen siding, 2,950 (0.55 miles), at $40,000	22,000		22,000
Sullivan's siding, 1,000 (0.19 mile), at $40,000	7,600		7,600
Sidings, 1W (0.19 mile), at $40,000	7,600		7,600
Sidings, 2, 1,200 (0.23 mile), at $40,000	8,500	700	9,200
Sidings, 2W, 700, at $7.60 per foot	5,000	500	5,500
Sidings, 2S, 1,500, at $7.60 per foot		11,500	11,500

Classified schedule of work to be done by June 30, 1919, including value of work done
May 21, 1918—Continued.

Location of work.	Cost to May 21, 1918.	To complete.	Total cost.
SECTION V.—*Yard*—Continued.			
Railroad tracks—Continued.			
Sidings, 2N, 1,400, at $7.60 per foot	$7,000	$4,000	$11,000
Sidings, 2A, 1,800, at $7.60 per foot	6,000	7,700	13,700
Sidings, 2B, 500, at $7.60 per foot	....	3,800	3,800
Sidings, 2C, 500, at $7.60 per foot	....	3,800	3,800
Sidings, Y1, 900, at $7.60 per foot	4,500	2,500	7,000
Sidings, Y2, 650, $7.60 per foot	3,200	1,800	5,000
Sidings, Y3, 350, at $7.60 per foot	2,000	600	2,600
Sidings, Y4, 350, at $7.60 per foot	2,000	600	2,600
Track 3, 1,500, at $7.60 per foot	4,000	7,500	11,500
Sidings, 3A, 800, at $8 per foot	....	6,400	6,400
Sidings, 3B, 400, at $7.60 per foot	2,000	1,000	3,000
Sidings, 3C, 600, at $4 per foot	....	2,400	2,400
Track 4, 1,000, at $8 per foot	....	8,000	8,000
Track 5N, 600, at $7.60 per foot	....	4,500	4,500
Sidings, 5S, 500, at $8 per foot	....	4,000	4,000
Sidings, 5, 500, at $7.60 per foot	2,500	1,300	3,800
Plum Point siding, 1,000, at $7.60 per foot	7,600	....	7,600
To detonating range (Michaelsville), 24,000, at $7.60 per foot	146,000	36,000	182,000
Trench warfare, 3,000, at $7.60 per foot	....	23,000	23,000
Aviation field, 7,000, at $7.60 per foot	....	55,000	55,000
Plate range, 3,500, at $7.60 per foot	....	26,000	26,000
Sidings 6, 2,600, at $7.60 per foot	....	18,300	18,300
Sidings 6a, 1,200, at $7.60 per foot	....	9,000	9,000
Sidings 7, 2,200, at $7.60 per foot	....	14,800	14,800
Sidings 7a, 600, at $7.60 per foot	....	4,500	4,500
Sidings 7b, 600, at $7.60 per foot	....	4,500	4,500
Sidings 7c, 900, at $7.60 per foot	....	6,500	6,500
Sidings 8, 3,000, at $7.60 per foot	....	23,000	23,000
Sidings 8a, 500, at $7.60 per foot	....	3,800	3,800
Sidings 8b, 400, at $7.60 per foot	....	3,000	3,000
Sidings 8c, 400, at $7.60 per foot	....	3,000	3,000
Sidings 8d, 1,000, at $7.60 per foot	....	7,600	7,600
Total	512,500	321,100	833,600
Dredging	30,000	30,000	60,000
Dock:			
Mulberry Point, 300×30=9,000, at $3.50	11,500	20,000	31,500
Plum Point	1,000	....	1,000
Total	12,500	20,000	32,500
Trestles:			
Plumb Point Road, 300 at $60 per foot	18,000	....	18,000
Mulberry Point, 1,200, at $60 per foot	72,000	....	72,000
Coal Trestle, 300, at $60 per foot	....	18,000	18,000
Total	90,000	18,000	108,000
Total yard	653,350	1,210,400	1,863,750
Add miscellaneous	....	126,600	126,600
Grand total	653,350	1,337,000	1,990,350
SECTION VII.—*Buildings.*			
Water batteries:			
Storehouse, 100×40=4,000, at $1.50	....	6,000	6,000
Constant temperature, 75×20=1,500, at $3	....	4,500	4,500
Powder magazine, 45×20=900, at $1.67	....	1,500	1,500
Total	....	12,000	12,000
Aviation Field:			
3 hangars (first squadron), 140×65=27,350, at $1.75	....	48,500	48,500
3 hangars (second squadron), 140×66=27,350, at $1.75	....	48,500	48,500
Barracks (150 men), 8,400, at $2.40	....	20,000	20,000
Barracks (second squadron), 8,400, at $2.40	....	20,000	20,000
Mess halls and equipment (first squadron)	....	10,000	10,000
Mess halls and equipment (second squadron)	....	10,000	10,000
Machine shop, 200×45=9,000, at $4.25	....	38,000	38,000
Blacksmith shop, 60×30=1,800, at $1.60	....	2,900	2,900
Officers' quarters (20 officers), 3,000, at $1.60	....	4,800	4,800
Officers' quarters (second squadron, 20 officers), at $1.60	....	4,800	4,800
Administration building, 2,800, at $1.75	....	4,900	4,900

Classified schedule of work to be done by June 30, 1919, including value of work done to May 21, 1918—Continued.

Location of work.	Cost to May 21, 1918.	To complete.	Total cost.
SECTION VII.—*Buildings*—Continued.			
Aviation field—Continued.			
Administration building (second squadron), 2,800, at $1.75		$4,900	$4,900
Dope house, 100×30=3,000, at $1.75		5.250	5,250
Aero supplies—Storehouse, 140×66=9,200, at $1.75		16.000	16,000
Bomb loading shed, 100×40=4,000, at $1.75		7,000	7,000
Bomb loading shed (second squadron), 100×40=4,000, at $1.75		7,000	7.000
Bomb storehouse, 100×40=4,000, at $1.75		7.000	7,000
Bomb storehouse (second squadron), 100×40=4,000, at $1.75		7.000	7.000
Toilet house, 50×30=1,500, at $1.65		2,500	2.500
Total		269,050	269,050
3 powder magazines, 45×20=2,700, at $1.67	$4,500		4,500
Buildings:			
Temporary black powder, 45×20=900, at $1.50	1,350		1,350
T. N. T. loading, 50×20=1,000, at $1.50	1,500		1,500
Bag sewing, 21×14=294, at $1.50	440		440
Toilet, 30×16=480, at $1.50	720		720
Oil storage (mobile), 10×10=100, at $2.50		225	225
Oil storage (sea-coast), 10×10=100, at $2.25		225	225
Projectile storage (sea-coast), 100×40=4,000, at $1.50	6,000		6,000
Temporary boiler house, 20×15=300, at $1.50	450		450
Sea-coast breech block, 90×30=2,700, at $1.67		4,500	4,500
Constant temperature magazine, 65×50=3,300, at $5	16,500		16,500
Sea-coast powder weighing, 60×60=3,600, at $1.67		6,000	6,000
Temporary tower A (mobile powder weighing), 100×40=4,000, at $1.50		6,000	6,000
Assembly shed, 100×40=4,000, at $1.50		6,000	6,000
Jolters, 40×48=1,900, at $1.50		2,880	2,880
Case storage, 100×40=4,000, at $1.50	6,000		6,000
Projectile storage (mobile), 100×40=4,000, at $1.50	6,000		6,000
Temporary latrine, 70×10=700, at $1.50	1,050		1,050
Fuse storage, 21×14=294, at $1.50	440		440
Fire house, 15×15=225, at $1.50	340		340
Eight time-keepers' towers, at $500	4,000		4,000
Star gauge house, 270×30=8,100, at $1.50		12,000	12,000
Mobile carriage assembly, 150×30=4,500, at $1.60			7,200
Temporary ordnance storehouse, 150×40=6,000 square feet, at $1.50	9,000		9,000
Ordnance checking station, 30×16=480 square feet, at $1.50	720		720
Temporary carpenter shop, 70×16=1,120 square feet, at $1.50	1,700		1,700
Six powder magazines, 45×20=5,400 square feet, at $1.30		7,000	7,000
Store shed, 15×15=225 square feet, at $1.50; 40×20=800			
Temporary garage, 130×35; 100×40; 80×35			
Temporary quartermaster stores, 100×35			
Temporary garage, 100×35			
Temporary machine shop, 100×25			
Temporary forge shop, 40×25			
Temporary power house, 35×25=875; 20×20=400 square feet.			
Temporary administration buildings:			
2, 100×25= 5,000			
1, 100×16= 1,600			
1, 70×16= 1,120			
1, 60×16= 960			
2, 50×16= 1,600			
2, 60×16= 1,920			
1, 40×16= 640			
1, 50×16= 800			
2, 30×16= 960			
Total.... 14,600 square feet, at $150	21,900		21,900
Temporary carpenter shop, 100×40=4,000 square feet, at $1.50		6,000	6,000
Store shed, 530×43=23,000 square feet, at $2.50	52,500	5,000	57,500
Store house:			
530×60=32,000, at $3	92,400	3,600	96,000
Power house basement:			
71×39=2,790			
Engine room:			
71×39=2,790			
Boiler room:			
74×43=3,190			
Total, 8,770 square feet, at $9	44,000	36,000	80,000

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Classified schedule of work to be done by June 30, 1919, including value of work done to May 21, 1918—Continued.

Location of work.	Cost to May 21, 1918.	To complete.	Total cost.
SECTION VII.—*Buildings*—Continued.			
Instrument building basement:			
85×40— 3,450			
First floor:			
85×40— 3,450			
Second floor:			
85×40— 3,450			
Total, 10,350 square feet, at $6	$52,000	$10,000	$62,000
Laboratory basement:			
150×50— 7,500			
First floor:			
150×50— 7,500			
Total, 15,000 square feet, at $5		75,000	75,000
Garage and fire department:			
85×28— 2,480			
55×30— 1,650			
55×30— 1,650			
Total, 5,780 square feet, at $3		17,340	17,340
Machine shop:			
500×120—60,000, at $5		300,000	300,000
Administration building, 30,000, at $2.50		59,700	75,000
Locomotive shed:			
120×30—3,600, at $2.80		10,000	10,000
Barracks 70:			
140×20—196,000 square feet, at $2	185,000	216,000	401,000
(All barracks to be made more weatherproof for next winter's use.)			
Mess halls, 18:			
90×40—65,000 square feet, at $1.75	63,300	51,700	115,000
Laboratories, 35:			
50×14—24,500 square feet, at $1.75	18,300	24,700	43,000
Wash room, 2:			
60×30—3,600 square feet, at $1.75	6,300		6,300
Hospitals, 2-story:			
100×20—4,000 square feet, at $1.50	6,000		6,000
Hospitals, 70 beds:			
2 wings, 350×30—21,000			
Corridor, 100×10—1,000			
Total, 22,000 square feet, at $3	66,000		66,000
Increase hospital to 200 beds by adding 4 wards, 21,000 square feet, at $3		63,000	63,000
Miscellaneous sheds, rear of hospital:			
4, 15×15—900 square feet, at $1.50	1,350		1,350
40×20—800 square feet, at $1.50	1,200		1,200
Nurses house, 6 nurses:			
1 wing, 66½×20—1,330			
1 wing, 38½×29½—1,140			
Total, 2,470 square feet, at $1.80	4,500		4,500
2 additional nurses' homes, 4,940 square feet, at $1.80		9,000	9,000
Stables, repairs to	5,000		
Hose houses, 4, 15×15—900 square feet, at $1.50	1,350		1,350
Remodeling and moving existing residences	10,000	10,000	20,000
Temporary boiler house, officers' quarters, 30×20—600 square feet, at $1.50	900		900
Servants' bungalow:			
28×28—784			
10×11—110			
Total, 894 square feet, at $1.50	1,350		1,350
Officers' bungalows, 12 for 96 officers:			
35×28—980			
10×11—110			
12×1,090—13,000 square feet	19,500	20,500	40,000
If provide quarters for 175 married officers:			
25 single bungalows, at $4,500		112,500	112,500
75 double bungalows, at $7,000		525,000	525,000
7 12-room bungalows for 84 single officers		35,000	35,000
Total officers' quarters, $19,500		693,000	712,500
Officers' mess equipment, if for 350 officers:			
130×40—5,200			
60×20—1,200			
60×30—1,800			
Total, 8,200 square feet, at $5.50	45,000		45,000

Classified schedule of work to be done by June 30, 1919, including value of work done to May 21, 1918—Continued.

Location of work.	Cost to May 21, 1918.	To complete.	Total cost.
SECTION VII.—*Buildings*—Continued.			
Trench warfare buildings:			
Tool house, 80×20=1,600 square feet, at $1.50	$2,400		$2,400
Black powder storehouse, 21×14=296 square feet, at $1.50		$450	450
H. E. storehouse, 21×14=296 square feet, at $1.50		450	450
Fuze storage, 21×14=296 square feet, at $1.50		450	450
Smokeless powder storage, 45×20=900 square feet, at $1.67		1,500	1,500
Bomb storage and assembly, 100×40=4,000 square feet, at $1.50	6,000		6,000
Additional bomb storage, 100×40=4,000 square feet, at $1.50		6,000	6,000
Constant temperature magazine, 75×20=1,500 square feet, at $3		4,500	4,500
Toilet, $1.75		1,500	1,500
Detonating range:			
Storehouse, 50×40=2,000 square feet, at $1.60	3,200		3,200
Temporary power, Plum Point, 50×30=1,500 square feet, at $2	3,000		3,000
Well house No. 1, 20×20=400 square feet, at $1.50	600		600
Temporary power, Swan Creek, 30×15=450 square feet, at $1.50	680		680
4 guard houses, 10×8=32 square feet, at $1.50	480		480
1 ice house, $2			
Total operating buildings	730,420	1,785,620	2,516,040
Additional miscellaneous		251,960	251,960
Grand total	730,420	2,037,580	2,768,000
Contractor's buildings:			
Time checkers, 30×15=480 square feet, at $1.50	720		720
Blacksmith shop, 60×20=1,200 square feet, at $1.50	1,800		1,800
Time checkers (2), 30×16=480 square feet, at $1.50	720		720
Time checkers (3), 30×15=480 square feet, at $1.50	720		720
Time checkers (4, 5, 6), 30×16=1,440 square feet, at $1.50	2,160		2,160
Time checkers (7, 8, 9), 50×16=2,400 square feet, at $1.50	3,600		3,600
Time checkers (10, 11, 12), 15×15=675 square feet, at $1.50	1,000		1,000
Blacksmith shop (2), 60×16=960 square feet, at $1.50	1,440		1,440
Storehouse, 80×72=5,760 square feet, at $1.70	9,800		9,800
Additional storehouse, 80×100=8,000 square feet, at $1.50		12,000	12,000
Barracks, 54, 140×20=151,000 square feet, at $1.50	50,000	175,000	225,000
Mess halls, 13, 90×40=47,000 square feet, at $1.50	22,000	48,000	70,000
Latrines, 27, 50×14=19,000 square feet, at $2.25	8,000	34,500	42,500
Contractor's and engineer's offices— 3, 140×20=8,400 1, 40×25=1,000			
Total... 9,400 square feet, at $1.50	14,000		14,000
Stables, 400 horses, 30,000 square feet, at $1		30,000	30,000
2 barracks, B. & O. yard, 100×16=1,600=3,200 square feet, at $1.50	4,800		4,800
2 office buildings, black gate, 140×20=5,600 square feet, at $1.50	8,400		8,400
13 latrines, 20×8=2,080 square feet, at $1.75	3,640		3,640
3 shacks, sawmills, 24×12=870 square feet, at $1.50	1,300		1,300
1 blacksmith shop, 20×20=400 square feet, at $1.50	600		600
1 bunk house, Michaelsville, 20×14=280 square feet, at $1.50	420		420
1 oil house, 10×8=80 square feet, at $1.50	120		120
1 oil and gasoline storehouse, 15×10=150 square feet, at $1.50	225		225
Total contractor's buildings	135,465	299,500	434,965
Additional miscellaneous		43,035	43,035
Total contractor's buildings	135,465	342,535	478,000
SECTION VIII.—*Proving ground facilities.*			
Range towers:			
A. Y axis	800		800
B. Mulberry Point		15,000	15,000
B-P. Black Point	1,000		1,000
C. Howell Point	1,000		1,000
D. Still Pond	1,000		1,000
E. Worton Point	1,000		1,000
F. Farley Point		1,000	1,000
G. Tolchester Beach		1,000	1,000
H. Swan Point		1,000	1,000
I. Huntingfield Point		1,000	1,000
J. Love Point		1,000	1,000
K. Delph Creek		1,000	1,000
L. Abbeys Point		1,000	1,000
M. White Oak Point		1,000	1,000
N. Bay Shore		1,000	1,000
8 timekeeper's towers, at $500	4,000		4,000
Trench warfare—			
50-foot tower, at $2,000		2,000	2,000
2, 20-foot towers, at $1,000		2,000	2,000
Aviation field-towers (bomb dropping):			
1, 70-foot tower, at $2,000		2,000	2,000
2, 40-foot towers, at $1,500		3,000	3,000

Classified schedule of work to be done by June 30, 1919, including value of work [illegible] *May 21, 1918*—Continued.

Location of work.	Cost to May 21, 1918.	To complete.	Total
SECTION VIII.—*Proving ground facilities*—Continued.			
Bomb proofs, temporary detonating range:			
At 1,300-yard station	$500		[illegible]
At 3,000-yard station	500		[illegible]
At 5,500-yard station		$500	[illegible]
(If new firing point is established):			
At 1,300-yard station rebuilt		500	[illegible]
At 3,000-yard station rebuilt		500	[illegible]
Bomb proof—Main range Y axis:			
At 1,300-yard station	500		[illegible]
At 3,500-yard station	500		[illegible]
1 each at—			
250-yard station, east side		460	[illegible]
600-yard station, east side		600	[illegible]
250-yard station, west side		460	[illegible]
500-yard station, west side		600	[illegible]
750-yard station, west side		600	[illegible]
1,000-yard station, west side		600	[illegible]
1,250-yard station, west side		600	[illegible]
1,500-yard station, west side		600	[illegible]
1,750-yard station, west side		600	[illegible]
2,000-yard station, west side		600	[illegible]
2,500-yard station, west side		600	[illegible]
3,000-yard station, west side		600	[illegible]
3,500-yard station, west side		600	[illegible]
4,000-yard station, west side		680	[illegible]
4,500-yard station, west side		700	[illegible]
5,000-yard station, west side		700	[illegible]
Total		9,600	[illegible]
Aviation field: 3, concrete and armor, at $2,666			[illegible]
Stockades and traverses—water range:			
4, at $400	1,600		[illegible]
3, at $400		1,200	[illegible]
1	1,000		[illegible]
5, at $1,000		5,000	[illegible]
Stockades and traverses—temporary detonating range:			
4, at $400	1,600		[illegible]
2, at $800	1,600		[illegible]
(If firing point moved)—			
4 rebuilt, at $400		1,600	[illegible]
2 rebuilt, at $800		1,600	[illegible]
Stockades and traverses—Mobile building		3,000	[illegible]
Stockades and traverses—Trench warfare:			
6, at $400	2,400		[illegible]
4, at $800	3,200		[illegible]
9, at $800		7,200	[illegible]
2, at $1,400		2,800	[illegible]
Stockades and traverses—permanent detonating range (Michaelsville):			
12, at $1,000	12,000		[illegible]
Fragmentation pit, east of Y axis, 1,300 cubic yards	2,000		[illegible]
Fragmentation pit, trench warfare		4,000	[illegible]
Ball and case velocity chamber—mobile battery	2,000		[illegible]
Emplacements, water battery:			
3-inch 15-pounder, 50 caliber		1,250	[illegible]
3-inch, 15-pounder, 40 caliber		1,250	[illegible]
75 m/m "A.A."		1,250	[illegible]
75 m/m improvised "A.A."		1,250	[illegible]
10-inch barbette		16,000	[illegible]
Emplacements, plate range		16,000	[illegible]
Emplacements, heavy artillery:			
3-inch, 15-pounder (model 1898).			
3-inch, 15-pounder (model 1903).			
4.7 howitzer.			
4.72 Armstrong.			
3-inch balanced pillar.			
6-inch balanced pillar (model 1900).			
2 8-inch barbette carriages.			
10-inch disappearing carriages.			
10-inch barbette.			
12-inch mortar.			
12-inch gunlift.			
12-inch barbette carriage.			
14-inch disappearing carriage.			
16-inch disappearing carriage.			
Total		170,000	[illegible]

Classified schedule of work to be done by June 30, 1919, including value of work done to May 21, 1918—Continued.

Location of work.	Cost to May 21, 1918.	To complete.	Total cost.
SECTION VIII.—*Proving ground facilities*—Continued.			
Emplacements, trench warfare		$1,000	$1,000
Concrete butt, water battery: 20, 10 by 10, 750 cubic yards at $20		15,000	15,000
Sand butts, plate range, 3,000 cubic yards, at $3		9,000	9,000
22 frames for above, at $2,000		44,000	44,000
Water butts, mobile battery, 100 by 20 by 20, 1,500 cubic yards, at $16.70		25,000	25,000
Total	$38,200	379,500	417,700
Add miscellaneous		37,600	37,600
Grand total, Sec. VIII	38,200	417,100	455,300
SECTION X.—*Power plant equipment.*			
Temporary installations, officers' quarters:			
Hot-water heaters and piping	2,000		2,000
80-horsepower boiler	1,800		1,800
Feed pumps	250		250
Steam piping and heating	8,000		8,000
Stack	400		400
Swan Creek pumping station:			
50-horsepower boiler	1,500		1,500
Pumps	500		500
Piping and heating hospital	6,000		6,000
Stack	400		400
Trestle-slough pumping station:			
20-horsepower boiler	600		600
Pumps	200		200
Temporary power plant (rear barracks No. 101):			
80-horsepower boiler	1,800		1,800
Pumps	250		250
Piping	1,300		1,300
Stack	400		400
Foundations and erection:			
30-kilowatt generator	800		800
Switchboard	600		600
Trestle-slough power plant:			
Setting for 300 horsepower Heine—			
Boiler	2,000		2,000
Grates	800		800
Setting up and foundation—			
200-kilowatt turbine generator	1,200		1,200
100-kilowatt generator	2,500		2,500
Setting up 100-kilowatt generator MG		500	500
Switchboard	1,500		1,500
Pumps	400		400
Station wiring	800	400	1,200
Set up Cochrane heater	200		200
Piping	1,500		1,500
Water supply	4,000		4,000
Central power plant:			
3 300-horsepower boilers	28,200		28,200
Additional boiler		10,000	10,000
Grates	2,000	700	2,700
Settings		3,300	7,200
Blowers	1,000	400	1,400
Breeching	2,500	300	2,800
Heater	1,500		1,500
2 feed pumps	840		840
3 vacuum pumps	820		820
2 service pumps	900		900
Compressors and piping		12,000	12,000
Steam and water piping		32,000	32,000
2 200-kilowatt generators D. C	17,500		17,500
1 100-kilowatt turbo-generator A. C		9,000	9,000
Switchboard	5,000	1,000	6,000
Stack 125 feet 7 inches	5,000		5,000
Total Sec. X	80,160	73,500	153,660
Add miscellaneous		7,500	7,500
Grand total Sec. X	80,160	81,000	161,160

Classified schedule of work to be done by June 30, 1919, including value of work done t May 21, 1918—Continued.

Location of work.	Cost to May 21, 1918.	To complete.	Total co
SECTION XVI.—*Transmission, power, and light.*			
Temporary plant, up to Feb. 12, 1918	$45,000		$45
Additional temporary plant required from temporary powder house to case storage mobile, 50 horsepower, constant temperature mobile, 15 horsepower, trench warfare, 40 horsepower, water range, 10 horsepower, temperature machine shop, 35 horsepower, hospital, 30 horsepower; 180 horsepower, at $1 per horsepower		$18,000	18,
Inside distribution system:			
Machine shop, 500 horsepower, carpenter shop, 75 horsepower, case storage, 50 horsepower, projectile storage, 10 horsepower, constant temperature mobile, 35 horsepower, jolters, 10 horsepower, shell sawing shop, 10 horsepower; 690 horsepower, at $20 per horsepower		13,800	13,
Underground wiring system:			
10,000 duct feet		4,000	4,
1,400 kilowatt power mains, at $70		98,000	9
Overhead line to aviation field, 120 kilowatts, at $60		7,200	7,
Motors:			
Temporary machine shop, 10 horsepower	300		30
Temporary machine shop, 35 horsepower	1,000		1,
Carpenter shop, 75 horsepower	1,900		1,90
Powder weighing, ¾ horsepower	130		13
Resizing—Mobile, 60 horsepower	1,800		1,
Resizing—Trench warfare, 30 horsepower		900	90
Cleaning projectiles, 10 horsepower		300	30
Constant temperature magazine (mobile), 15 horsepower	450		4
Constant temperature magazine (trench warfare), 10 horsepower	300		30
Constant-temperature magazine (water range), 10 horsepower	300		30
Railway-mount machine shop, 500 horsepower		15,000	15,
Horsepower steam to hammers		3,000	3,
Shafting hangers, pulleys, and belting:			
Temporary machine shop	3,500		3,
Additional temporary machine shop	4,000		4,
Case storage, mobile battery	300		3
Carpenter shop		500	5
Total	58,980	160,700	219,
Add miscellaneous		22,320	22,3
Grand total, Section XVI	58,980	183,020	242,
SECTION XX.—*Heating and ventilating.*			
Machine shop		30,000	30,
Railway-mount barracks		30,000	30,
Heavy-artillery buildings		25,000	25,
Mobile-artillery buildings		25,000	25,
Trench-warfare buildings		6,000	6,
Main proving ground, barracks and quarters		67,000	67,
Main proving ground, industrial buildings		25,000	25,
Aviation-field buildings		20,500	20,
Buildings under way		7,200	7,
Temporary heat to Feb. 12 (stoves, etc.)	25,000		25,
Total	25,000	235,700	260,
Add miscellaneous		26,300	26,
Grand total, Section XX	25,000	252,000	287,

NOTE.—For temporary and outside wiring, see Sec. XVI.

Location of work.	Cost to May 21, 1918.	To complete.	Total co
SECTION XXI.—*Electric lighting.*			
Machine shop, railway mount		8,000	8,
Barracks, sheds, and quarters, railway mount		12,000	12,
Heavy artillery battery		4,000	4,
Mobile artillery battery		8,000	8,
Trench warfare		3,000	3,
Main proving ground, barracks and quarters		18,000	18,
Main proving ground, industrial buildings		8,000	8,
Aviation field		17,700	17
Street lighting and guard lighting		5,000	5,
Total		83,700	83,
Add miscellaneous		8,300	8,
Grand total, Section XXI		92,000	92,

Classified schedule of work to be done by June 30, 1919, including value of work done to May 21, 1918—Continued.

Location of work.	Cost to May 21, 1918.	To complete.	Total cost.
SECTION XXII.—*Plumbing and sewers.*			
Railway mount machine shop		$3,000	$6,000
Railway mount barracks and quarters		25,000	25,000
Heavy artillery		2,000	2,000
Mobile artillery		2,000	2,000
Trench warfare		5,000	5,000
Civilian barracks		5,000	5,000
Officers' quarters		6,000	6,000
Main barracks		9,000	9,000
Industrial group		30,000	30,000
Aviation field		18,350	18,350
To complete work under way	$61,000	7,200	68,200
Total	61,000	115,550	176,550
Add miscellaneous		17,450	17,450
Grand total, Section XXII	61,000	133,000	194,000
NOTE.—Above includes septic tanks, sewerage disposal plant, and central incinerator.			
Railway mount, barracks and quarters		2,000	2,000
Railway mount, machine shop		1,500	1,000
Heavy artillery			
Mobile artillery			
Trench warfare		3,000	3,000
Civilian barracks, officers' quarters, main barrack, industrial group		142,300	142,300
Aviation field		50,500	50,500
To complete work under way	24,000	3,600	27,600
Total		202,400	226,400
Add miscellaneous		22,600	22,600
Grand Total Section XXII-A	24,000	225,000	249,000

(NOTE.—The above includes six wells, at $10,000 each. Reservoir, at $30,000; receiving tank, $3,000; 50,000 gallon storage tank and foundation, $10,000; total, $103,000.)

It is recommended that an additional storage reservoir be built on Swan Creek, west of Aberdeen, Md., and pumping station installed; and pipe line extended to distribution systems of proving ground.

25,000 feet pipe line, 12-inch mains, at $8	$200,000
Intake reservoir, capacity 2,000,000 gallons	30,000
Pumping station	15,000
Chlorination plant	20,000
Total	265,000

Location of work.	Cost to May 21, 1918.	To complete.	Total cost.
SECTION XXIII.—*Refrigeration plants for constant temperature magazines.*			
Water range		5,000	5,000
Mobile and heavy artillery	15,000	1,400	16,400
Trench warfare	3,000	2,000	5,000
Total	18,000	8,400	26,400
Add miscellaneous		2,600	2,600
Grand total Section XXIII	18,000	11,000	29,000
SECTION XXIV.—*Elevators.*			
Instrument building	800		800
SECTION XXV.—*Service equipment.*			
Work in progress:			
Portable chemical engines, fire extinguishers, etc		2,000	22,000
2 fire pumps, 1,000 gallons per minute capacity			4,000
100 hydrants, at $75		6,000	7,500
5,000 feet hose, at $1		5,000	5,000
Nozzles, reels, and hose houses		1,500	1,500
Motor-driven chemical engine		5,000	5,000
Motor-driven hose cart		2,000	2,000
Fire pails and racks		1,500	1,500
Total fire protection		23,000	48,500
Add miscellaneous		7,500	7,500

NOTE.—Fire protection mains included in water supply.

Classified schedule of work to be done by June 30, 1919, including value of work done to May 21, 1918—Continued.

Location of work.	Cost to May 21. 1918.	To complete.	Total [illegible]
SECTION XXV.—*Service equipment*—Continued.			
Cranes:			
By mounts 1 150-ton locomotive		$55,000	[illegible]
6-jib cranes		1,800	[illegible]
Machine shops, 1 75-ton		75,000	[illegible]
Heavy artillery, 1 150-ton locomotive		55,000	[illegible]
Power house, 5-ton	$900		[illegible]
Mobile car shop, 5-ton		900	[illegible]
Seacoast breechblock, 5-ton		900	[illegible]
2 portable, 1½-ton	200		[illegible]
Seacoast projectile 4-jib cranes		1,200	[illegible]
Total	1,100	189,800	[illegible]
Add miscellaneous		19,100	[illegible]
Grand total	1,100	208,900	[illegible]

NOTE.—The 250 gross ton 100-foot span Gantry crane is now thought to cost more than its use would justify and it is now omitted. Its cost would be as follows:

Crane	$180,000
Concrete runways	25,000
Collectors and wiring	10,000
	215,000

Delivery 7–9 months.

Industrial railway:			
Labor—laying only track from S. H. P. G	1,000		[illegible]
Sump pumps:			
14-inch implacement		500	[illegible]
16-inch implacement		500	[illegible]
15 transveyor trucks		2,250	[illegible]
200 skids		400	[illegible]
5 storage-battery tractors		20,000	[illegible]
40 trailers for above		6,000	[illegible]
5 trailers for automobile trucks		750	
Total trucks and trailors		29,400	[illegible]
Fuel oil, storage and distribution, one 10,000 gallon tank, etc		4,300	[illegible]
Gasoline storage, east of S. H., $2,000			[illegible]
Two 10,000-gallon tanks and piping, aviation field		7,100	[illegible]
Total oil and gasoline storage, $2,000		11,400	[illegible]
SECTION XXVI.—*Telephone, telegraph, and signal circuits*			
Cost of system to May 21	40,000		[illegible]
Water battery		300	[illegible]
Heavy artillery buildings		500	
Heavy artillery platform, heavy (10) phones		250	
Mobile artillery buildings		300	[illegible]
Mobile artillery platform, mobile (10) phones		250	
Trench warfare		500	[illegible]
Aviation field		1,300	[illegible]
Industrial group (100)		2,500	[illegible]
Phones, underground distribution, 20,000 duct feet		4,000	[illegible]
Barracks, quarters, etc.—			
Main P. G., 200 phones		3,000	[illegible]
Powder magazines, storage		400	[illegible]
½-mile line, 6 phones		150	
Main switchboard		10,000	[illegible]
Bomb proofs and traverses, trench warfare, 12 phones		600	[illegible]
Guardhouses on reservation line, 5 phones		125	
Detonating ranges (Michaelsville)		7,000	[illegible]
1 mile line, 6 phones		150	[illegible]
Aviation field bomb proofs and towers		1,500	[illegible]
1-mile line, 6 phones		150	
Extension of line, temporary detonating range, 3-mile line		4,500	[illegible]
Plate range		400	[illegible]
½-mile line, 2 phones		50	[illegible]
Total	40,000	44,825	[illegible]
Add miscellaneous		8,175	[illegible]
Grand total	40,000	53,000	[illegible]

Classified schedule of work to be done by June 30, 1919, including value of work done to May 21, 1918—Continued.

Location of work.	Cost to May 21, 1918.	To complete.	Total cost.
SECTION XXVI.—*Telephone, telegraph, and signal circuits*—Con.			
Wireless telephone		$25,000	$25,000
Water battery		2,500	2,500
		27,500	27,500
Fire alarm signals and wiring:			
50-station		1,500	1,500
Watchman's clocks, portable		750	750
		2,250	2,250
		250	250
		2,500	2,500
Chronograph circuits:			
Water battery	$1,000		1,000
Heavy artillery		3,000	3,000
Mobile artillery	1,000	3,000	4,000
Trench warfare	1,000		1,000
15 sets instruments, 45, at $800	36,000		36,000
1 recording instrument, instrument building	2,000		2,000
Wiring for record, instrument		3,000	3,000
Switchboard "a" tower		4,800	4,800
Storage batteries, 1,000 calls	9,000		9,000
35 static annunciators, administration building	125	875	1,000
Lightning protection, 15 mags.			
Total circuits	50,125	29,765	79,800
Add miscellaneous		2,925	2,925
Total	50,125	32,600	82,725
Grand total	90,125	115,600	205,725
SECTION XXVII.—*General equipment.*			
Machine-shop tools and their formations	35,000	141,600	176,600
Carpenter tools		7,000	7,000
Assembly sheds tools, mobile:			
2 15-ton presses	2,400		2,400
1 30-ton press	4,800		4,800
2 tanks, case cleaning	800	200	1,000
2 assembly presses	2,200		2,200
Resizing dies	4,500		4,500
Assembly press	400		400
Aviation field, shop tools		15,000	15,000
Trench warfare, assembly shed:			
30-ton press		4,800	4,800
Dies and gauges		4,800	4,800
Star-gauge equipment	20,000	5,000	25,000
Ring gauges	3,000	1,000	4,000
Quadrants	1,500	500	2,000
Pressure-gauge equipment	1,600	1,000	2,600
Scales:			
Seacoast projectile (2), 400-pound		2,400	2,400
Mobile projectile (2), 300-pound		600	600
Seacoast powder (2), 30-pound		600	600
Seacoast powder (1), 1,000-pound		1,000	1,000
Mobile powder (4), 300-pound		1,200	1,200
Trench warfare (2), 300-pound		600	600
Scoops, pans, etc		1,500	1,500
Scale, railway-track, 250,000-pound		6,000	6,000
Small tools		5,000	5,000
Sewing machines (6)	120	120	240
Hydraulic jacks	1,000		1,000
Triplex blocks, slings, etc	1,200		1,200
Total	78,520	199,420	277,940
Rolling stock:			
Locomotives, railway mount	27,000	30,000	57,000
Locomotives, general		40,000	40,000
Flat cars, 6, at $2,500		15,000	15,000
Total	27,000	85,000	112,000

Classified schedule of work to be done by June 30, 1919, including value of work done May 21, 1918—Continued.

Location of work.	Cost to May 21, 1918.	To complete.	Total cos
SECTION XXVII.—*General equipment*—Continued.			
Boats:			
70-foot patrol	$35,000		$35,
2 launches		$7,000	7,
Total	35,000	7,000	42,
Blast apparatus and furnaces, forge shop:			
Motor-driven blower and piping		500	5
3 furnaces		1,500	1,5
Exhaust apparatus, carpenter shop: Motor-driven fan and piping		2,500	2,5
Storage bins:			
Storehouse	3,500	1,500	5,
Projectile storage	2,000	1,000	3,
Case storage	2,000	2,000	4,
Quartermaster storehouse		2,000	2,
Total			14,
Special instruments:			
Anemometers			
Azimuth indicator			
Rain gauges			
Thermometers			
Transits			
Stadea rods			
Stop watches			
Field glasses			
Theodelites			
Steel tapes, etc			
Total			10,
Office furniture and fixtures:			
Field-office furniture	5,000		5,
Administration building	15,000	15,000	30,
Photographic and instrument building	2,000	2,000	4,
Industrial buildings	2,000	3,000	5,
Total	24,000	20,000	44,
	182,020	322,420	504,4
Add miscellaneous		32,580	32,5
Grand total	182,020	355,000	537,0

Mr. BORLAND. What do you mean by "included in estimate 5-5-18"? Is that this estimate?

Col. DILLARD. No; that is a separate estimate which really has no significance in these hearings. We saw that we were going to come to the end of our money on the 5th of May and money had to be obtained or else we had to stop work at Aberdeen. We first made an effort to introduce into a bill then in the Senate a deficiency appropriation for some money, but we got it in a day too late; the Senate committee being ready to report the bill. Then we went to the Secretary of War and asked for $3,000,000 out of the President's fund. but the Secretary turned it down. We then decided that in order to continue the work which had to go on, we would use manufacturing funds. We carefully went over the entire situation, trimming everything down to the bone, and decided to continue this work out of the manufacturing appropriations, making allotments every two weeks to meet the pay roll and in order to carry on the work until we could get the estimate I am now speaking about through. The total amount we are now expending is about $100,000 a week.

Mr. **Borland**. That is really a deficiency?

Col. **Dillard**. Yes, sir; we are now creating a deficiency, because we are expending manufacturing funds for this purpose.

Mr. **Borland**. Why did you not include it in the bill that just went through?

Col. **Dillard**. It is necessary to pay the men right now.

Mr. **Borland**. It is a deficiency in this fiscal year?

Col. **Dillard**. Yes; we are actually using manufacturing funds. We had to have money in the bank to meet the pay roll every Saturday night.

Mr. **Borland**. At Aberdeen?

Col **Dillard**. Yes, sir.

Mr. **Borland**. You are actually creating a deficiency at Aberdeen because you are using other funds for that purpose?

Col. **Dillard**. Yes, sir.

Mr. **Borland**. Why did you not put that in the deficiency bill which has just passed, which contains deficiencies for this fiscal year?

Col. **Dillard**. Well, that can be charged off of this account. It amounts to about $100,000 every week, and for every week after May 21 that we fail to get this money $100,000 could be deducted from the amount we are asking for under this bill.

Mr. **Borland**. But you will not get this right away.

Col. **Dillard**. The manufacturing funds may legally be used for this purpose.

Mr. **Borland**. For the testing of ammunition?

Col. **Dillard**. Yes, sir; and they are simply being used to meet the pay roll in the least amount possible.

Mr. **Borland**. But that confuses the committee, although it might be clear to you. We have given you a certain amount of money for manufacturing purposes and to cover a specific program of shells and guns. Another thing about it, Colonel, is that you have an additional request in for $2,180,000 for which there is no estimate before the committee.

Col. **Dillard**. No, sir; but I have the details here and I want to explain them to you as well as I can.

Mr. **Borland**. You have the details, you say?

Col. **Dillard**. Yes, sir.

Mr. **Borland**. Has that estimate been approved by the Secretary of War?

Col. **Dillard**. No, sir; it has not. A letter was prepared, but this hearing was a little unexpected.

Note.—The letter has since been sent to the Secretary of War and it is our understanding that it has been forwarded to your committee.

Mr. **Borland**. I am not criticizing you at all, but you can see that as far as Congress is concerned we are within one month of the end of the fiscal year, by which time this bill must go through, and all of these estimates should have been sent in to the committee. Certainly Congress has been here ready to act at any time.

Col. **Dillard**. The real difficulty is that the original estimate was too small, viz, the $5,000,000; and the necessity for providing a proving ground for 3,000,000 men has just recently arisen. Of course, we might have foreseen it some time ago, but I do not know whether we would have gotten the money for it or not.

Mr. **Borland.** You have here an item of $2,000,000 for buildings. That includes your machine shops, your storehouses, and everything there, does it?

Col. **Dillard.** Yes, sir.

Mr. **Borland.** It is the completion of that whole program?

Col. **Dillard.** The amount we are asking for will expand the Aberdeen Proving Ground to the maximum amount which we believe it is capable of; in other words, we do not believe it is possible to put any more guns on there to shoot than we are arranging for under this program.

Mr. **Good.** How much have you expended on the Aberdeen Proving Ground to date?

Col. **Dillard.** $6,889,276.22, to May 25, 1918.

Note—This total, June 5, 1918, is $6,988,766.22.

Mr. **Good.** That includes the building of the railroad, does it?

Col. **Dillard.** Yes, sir; but the railroad is not in as good shape as it will have to be to accommodate the traffic that will pass over it when we are firing 12,000 rounds a day and additional spurs and other trackage must be provided.

Mr. **Good.** That includes about 35,000 acres of land?

Col. **Dillard.** Yes, sir.

Mr. **Good.** You are asking for about $2,000,000 more than the total cost to date?

Col. **Dillard.** Yes, sir. Part of that is required for a machine shop. We have this heavy railway artillery program coming through there, and there is going to be a great deal of proof firing on that, and there is required quite a machine shop to handle it; then we have the field-gun carriages coming there, and every hydropneumatic recoil system has to be adjusted after it is proof fired. The interior of that type mechanism is like a watch; after proof firing there are certain parts of it that have to be taken down and some handwork done on them, and then they are put back together again and fired again.

Mr. **Good.** We have already given you money for a machine shop, have we not?

Col. **Dillard.** No; the machine shop is now in a little frame building there, and is not anywhere nearly adequate for the present work to be done there.

Mr. **Good.** We have not appropriated, then, for a permanent machine shop there?

Col. **Dillard.** No, sir. I can not say positively what has been stated in previous hearings, but of the money which has been appropriated none has been spent on anything which could be considered a machine shop.

Mr. **Borland.** They are constructing two very substantial brick buildings, one of which was to be the quartermaster's warehouse and the other, I understood, was to be the machine shop.

Col. **Dillard.** No, sir; that was another storehouse; there are two storehouses.

Mr. **Good.** The machine shop is to be located in between the two storehouses?

Col. **Dillard**. Yes, sir. We intend to build for a shop of this type a temporary machine shop which will be brick up to about 4 feet and galvanized iron, with simply the necessary windows and with enough steel framework to support the crane.

Mr. **Borland**. Captain, please tell the committee what is to be done at Aberdeen in regard to proof firing.

Capt. **Roberts**. I will file the following statement which will show just what it is intended to do in that regard:

	Rounds.	
	Average.	Maximum.
Water battery:		
Range firing, 3-inch, 75 mm. and up	75	200
Antiaircraft, 3-inch, 15-pounder, 4.7	75	150
6-inch improvised seacoast, 60°	25	50
R. R. mount—		
8, 10, 12, and 14 inch guns; 12-inch mortar; 16-inch howitzers	20	40
Total water battery	195	440
Heavy artillery:		
5 and 6 inch	100	150
8-inch	100	150
10-inch	200	300
12-inch mortar	30	40
12-inch	50	60
14-inch	10	15
16-inch disappearing	10	15
Total heavy artillery	500	730
Mobile artillery:		
Detonating ranges	1,200	1,400
Case tests	400	600
Common shell	500	700
Night tracers	60	100
Shrapnel	1,500	1,800
Powder	300	500
Primers	60	100
Time fuzes	1,000	1,200
Fixed rounds	1,000	1,200
Total mobile acceptance and development	6,020	7,600
Trench warfare:		
240 mm. howitzers	200	300
3-inch Stokes	3,000	3,500
6-inch Newton-Stokes	200	250
6-inch Sutton	200	250
11-inch Sutton	200	250
20-inch Sutton	200	250
V. B. rifle grenades	2,000	2,500
Total trench warfare	6,000	7,300
Aviation field	40	60

	Rounds.		Number guns.		Number carriages.	
	Average.	Maximum.	Average.	Maximum.	Average.	Maximum.
Proof of guns and carriages:						
R. R. mount	10	20	1	2	1	2
155-mm. mobile carriage	50	100	10	20	10	20
240-mm. mobile carriage	15	30	2½	5	2½	5
4.7 F. G. carriage	5	10	1	2	1	2
	80	160	14½	29	14½	29
Grand total	12,835	16,290	14½	29	14½	29

None of that is being done at Aberdeen now.

Mr. BORLAND. You expect to prepare for the new work that is not now being done at Aberdeen but being done at the Sandy Hook Proving Ground?

Capt. ROBERTS. Yes, sir. It runs up to about seven and a half times what we are now doing.

Mr. BORLAND. I wish you would state how much you want in cash and how much in contract authorization.

Col. DILLARD. It is going to be necessary for us to complete all of this work before next spring in order to meet the peak load. The peak load will begin about September, and will probably reach the maximum—we expected it to reach the maximum about October or November on the 2,000,000 men basis, but with the additional material which will be ordered for 3,000,000 men it will probably reach the maximum about February or March, and we should do all of this work before next December.

Mr. BORLAND. Before December, 1918?

Col. DILLARD. Yes, sir; because if we do not do it by then it will cost us a great deal more money than it will this summer, on account of the higher unit costs that come in when work is done in the winter. We must have those roads down in order to get around, because we were greatly hampered in getting work done last winter by road conditions there.

Mr. BORLAND. Then, you need all of this in cash in this bill?

Col. DILLARD. Yes, sir; and we expect to spend practically all of it before the 1st of January. This is work which can be done cheaper in the summer time than it can at any other time and it is work which must be done by next fall, in order to keep up with the deliveries of material. It sounds like a good deal of money, but you could actually amortize in a year the total cost of this proving ground at about one-seventh of the value of the ammunition which is fired in a year.

Mr. GOOD. You have already constructed buildings that cost about $730,000 and expect to construct buildings that will cost about $2,000,000 more?

Col. DILLARD. Yes, sir.

Mr. GOOD. Your details show what those buildings are, do they?

Col. DILLARD. Yes; they do.

Mr. BORLAND. I wish you would furnish me with a copy of the detailed statements which you have there.

Col. DILLARD. We will leave copies with you.

WEDNESDAY, *June 5, 1918.*

COASTAL AIR STATIONS IN THE UNITED STATES.

ADDITIONAL STATEMENT OF COL. H. H. ARNOLD, SIGNAL CORPS, UNITED STATES ARMY.

Mr. BORLAND. Colonel, we will hear you upon these estimates for the construction of 16 permanent coastal stations in the United States, to cost $16,000,000.

Col. ARNOLD. In a letter from The Adjutant General to all department commanders, dated August 15, a copy of which was furnished to the Chief Signal Officer, the Secretary of War outlines the location of our aerial coast defense units as follows: Portland, Me., 1 squadron; Boston, Mass., 2 squadrons; Narragansett Bay, 1 squadron; eastern end of Long Island Sound, 1 squadron; New York City, 2 squadrons; Philadelphia, including Delaware Bay, 1 squadron; Chesapeake Bay, 1 squadron; Charleston, S. C., 1 squadron; San Diego, 1 squadron; San Francisco, 2 squadrons; entrance to Columbia River, 1 squadron; and Puget Sound, 2 squadrons, making a total of 16 squadrons. At the time that letter was written——

Mr. BORLAND (interposing). What is the date of that letter?

Col. ARNOLD. August 15, 1917. At the time that letter was written it was stated that no aeronautical equipment should be sent over to the Philippine Islands during the continuance of the present conditions, and that the supply of such equipment to the other insular possessions and to the continental United States should be held subordinate to and should not be permitted to interfere with the rapid accomplishment of the program for the supply of aeronautical equipment for operations in France.

Mr. BORLAND. The estimate which you have here is simply for the construction of coastal stations and not for the purchase of equipment. Will you describe to the committee of what the construction of the 16 permanent coastal stations will consist?

Col. ARNOLD. That contemplates the expenditure of $1,000,000 for each of the 16 stations, and each station would have constructed the following buildings: Three mess halls, 1 dope house, 1 guardhouse, 1 latrine, 1 boiler house, 1 officers' mess, 1 commanding officer's quarters, 1 administration building, 1 machine shop, 1 aerial repair shop, 1 garage, 6 hangars, 1 hospital, 1 supply building, 1 post exchange, 5 sets of officers' and noncommissioned officers' quarters, 3 barracks, 1 blacksmith shop, 1 motor test shed, and 1 post bakery. Those buildings would be constructed at each station for about $800,000. The heating, lighting, plumbing, water supply, sewerage, and roads at each station would cost about $200,000, making a total of about $1,000,000 per station.

Mr. BORLAND. I understood you to say that there would be 16 stations, and that at some stations two or more squadrons would be located.

Col. ARNOLD. They would be at one station. For instance, take a place like Boston. Squadrons would be located there for the defense of Boston, and one squadron might be placed on one side of the harbor and one on the other side.

Mr. BORLAND. So that there would be a permanent coastal station for each squadron?

Col. ARNOLD. Yes, sir.

Mr. BORLAND. That is the plan, is it?

Col. ARNOLD. Yes, sir. As a matter of fact, each department commander upon receipt of this letter sent a board of officers around to select sites, and I think we have now received reports from all the department commanders. They were very carefully gone over, and the Director of Military Aeronautics selected an aviator to go around and verify the selections made by the department commanders, and he is now making those verifications.

Mr. GOOD. How much ground would be required?

Col. ARNOLD. A very small amount of ground, just large enough to put the buildings on, and enough to have a drill ground to keep the men exercised. It is not like a land station where you must have a long runway for the land machines. Landings will be on the water.

Mr. SLEMP. Is there any provision made for the purchase of t[illegible] sites?

Col. ARNOLD. There was provision made in the original estimate for the purchase of a certain number, but the idea we have there is that none of them would be purchased, but that they would be rented.

Mr. GOOD. These are not to be permanent stations?

Col. ARNOLD. That is at the discretion of the Secretary of War. Of course, he says here that we are not to do anything to interfere with the operations over seas.

Mr. GOOD. You will locate some of these buildings on rented land?

Col. ARNOLD. We are doing that right along. All of our buildings are so located.

Mr. GOOD. Are they permanent buildings?

Col. ARNOLD. These are to be of a semipermanent character. None of them are what we call permanent buildings. There is not a single concrete or brick building in the lot. They are all frame buildings.

Mr. BORLAND. What is the purpose of these coastal stations, or what duties do these squadrons perform?

Col. ARNOLD. There are two classes of duties: One is the observation of Artillery fire, and the other is a small amount of reconnoissance immediately in front of each station.

Mr. BORLAND. Do you mean the observation of Artillery fire at some adjacent place, or fortification?

Col. ARNOLD. Yes, sir.

Mr. BORLAND. And they do reconnoissance work?

Col. ARNOLD. They do reconnoisance duty out beyond to the limits where the Navy joins on.

Mr. BORLAND. Are they designed to protect a fortified city or the fortifications themselves against any attack from the air?

Col. ARNOLD. Yes, sir; and they have machine guns mounted on them for that purpose. They will be rather unwieldy in action against planes of the small fast scout type, but probably they would not have to be called upon to meet the small scout type of plane. They will probably only be called upon to meet the same type as they are, that is, the heavy seaplane. Any enemy craft coming in would have to come in on the water, so that it would naturally be of the seaplane type.

Mr. BORLAND. How long do you think it would take to construct these 16 stations?

Col. ARNOLD. It has taken in the past about six weeks to put up a station of the same number of buildings from the time the construction was started until the time when the station was occupied.

Mr. BORLAND. How many men are housed in these barracks, or how much personnel is at these stations?

Col. ARNOLD. Each squadron station contemplates the housing of 150 enlisted men and 24 officers. That is, providing there is no training carried on at the station. If there is training carried on at the station, that would increase the garrison so that at least 50 students could be taken care of in addition.

Mr. BORLAND. Are you ready to go ahead with the construction of these stations?

Col. ARNOLD. The sites have been selected, but that is all that has been done so far.

Mr. BORLAND. Do you anticipate any difficulty in the matter of labor and materials?

Col. ARNOLD. We have not experienced any difficulty so far in the construction of any of our land stations.

Mr. BORLAND. You said that the sites were being rented?

Col. ARNOLD. I said that they had been selected.

Mr. BORLAND. You expect to rent them?

Col. ARNOLD. Yes, sir.

Mr. GOOD. Do you contemplate using any lands on the fortifications sites?

Col. ARNOLD. The board went into that very carefully, but I do not believe that they found many that were absolutely suitable on Government land, due to the fact that the coastal defenses as a usual thing come right down to the water's edge, and it would be impracticable to put up our stations in very close proximity to the big guns that are being fired.

Mr. GOOD. How soon do you think you would be equipped or furnished with airplanes for these stations?

Col. ARNOLD. It depends upon the urgency. If the need is urgent, as it is this particular minute, we could have the airplanes before we would have the buildings completed.

Mr. EAGAN. In less than six weeks?

Col. ARNOLD. Yes, sir; in less than six weeks.

Mr. GOOD. Evidently, from the letter of the Secretary of War, he does not consider that these stations are very urgent, or that the construction of them is very urgent—that is, as compared with the need of planes over in France.

Col. ARNOLD. Do you mean this letter of August 15?

Mr. GOOD. The letter of May 31. The Secretary of War states that this work shall in no way retard the sending of planes abroad, as I understand it.

Col. ARNOLD. That is in the letter of August 15.

Mr. BORLAND. There is an estimate here, also, for the construction of 20 permanent balloon coastal stations, at a cost of $2,500,000. What does a balloon coastal station consist of?

Col. ARNOLD. Do you care to know the location of them?

Mr. BORLAND. Yes; give us the location of them.

Col. ARNOLD. The balloon stations are to be located as follows: One squadron headquarters at Boston, with two companies at Boston, one at the coast defenses of Portland and one at Narragansett Bay. A balloon squadron is composed of four companies. There will be one squadron headquarters at Long Island Sound, with two companies in the defenses of Long Island Sound and two companies in the coast defenses at Sandy Hook; one squadron headquarters at Chesapeake Bay, with two companies at Fort Storey, one at Fort Monroe, and one at Fort Saulsbury; one squadron headquarters at Fort Moultrie, with one company at that fort, one at Fort Taylor, one at Pensacola, and one at Galveston; one squadron headquarters at San Francisco, with one company in the coast defenses of that place, one in Puget Sound, one at the Columbia River, and one at

Los Angeles. That makes a total of 20 companies. The buildings necessary for a balloon company are as follows: One barracks, one mess hall, one commissioned officers' quarters, and one balloon shed at a total cost of about $125,000. It is to be noted in this connection that most of these balloon companies will be located at coast-defense stations already existing.

Mr. Borland. Does not that mean that they will be located on the land of the coast defense station?

Col. Arnold. Yes, sir.

Mr. Borland. What is the purpose of a balloon company in conjunction with the coast defenses?

Col. Arnold. A balloon company can be used for only one thing, and that is for the observation of artillery fire. By having the observers up, say about 5,000 feet in the air, they are able to get closer data on where the shots go than they would be if they were following the normal method of observing from the ground. But it can be used only for that purpose and nothing else.

Mr. Eagan. Are they captive balloons?

Col. Arnold. Yes, sir; of the so-called sausage type.

Mr. Borland. How soon can you have these stations built?

Col. Arnold. We could have these balloon stations constructed in approximately the same time that would be required for the other stations, or about six weeks. It would be about six weeks from the time one was started until it was completed.

Mr. Borland. How long will it take to equip a balloon company?

Col. Arnold. We are having a much easier time in getting balloons than we are in getting airplanes. The two rubber companies at Akron, Ohio, are more than able to furnish us with balloons, because in addition to those they are furnishing us they are furnishing balloons for the English Government.

Mr. Borland. Have you ordered many balloons?

Col. Arnold. For this particular purpose, no, sir.

Mr. Borland. Have you ordered any for any purpose?

Col. Arnold. Yes, sir; we have balloons overseas. * * *

Mr. Borland. Is it your purpose to send in further estimates for balloons?

Col. Arnold. No, sir; the equipment for the balloon companies will have to come out of the hold-over funds from the last appropriation

Mr. Good. Why should not these stations be permanent?

Col. Arnold. There is no reason why they should not be permanent.

Mr. Good. It seems to me if there is any reason for their erection now as a temporary matter——

Col. Arnold (interposing). The buildings that we put up are semipermanent, but, as a matter of fact, we look forward to using them for many years, because these frame buildings, if taken care of, will last almost indefinitely.

Mr. Good. What rental will you be compelled to pay for land?

Col. Arnold. The rental in the case of most of our coast defense stations will be greater than the rental we are paying for our flying fields, due to the fact that these are in all cases near large cities.

Mr. Good. Could you give the committee any idea of what the rental will be for a station?

Col. ARNOLD. I am unable to say exactly what the rental will be for any particular piece of ground, or what rent we will have to pay for any particular piece of ground, but I do know that in some cases we have had to pay as high as $500 per acre.

Mr. GOOD. As rental?

Col. ARNOLD. Yes, sir; that is, near large cities. In other cases, where it is not near large cities, we get land as cheap as $50 per acre.

Mr. GOOD. Per annum?

Col. ARNOLD. Yes, sir.

Mr. GOOD. Is it contemplated that you will utilize these stations for several years, even after this emergency is over?

Col. ARNOLD. Yes, sir.

Mr. GOOD. So far as you can see now, they will be a permanent part of the coast defenses?

Col. ARNOLD. Yes, sir.

Mr. GOOD. Then, why should they not be constructed on land that the Government owns?

Col. ARNOLD. It has been the policy of the War Department ever since the war started to buy no land, and the Chief Signal officer, under whom these estimates were prepared, stated before the committee, and made a point of it, that no land had been purchased, although he had been given money with which he could have purchased land.

Mr. GOOD. You do not propose to locate one of these stations at Rockaway?

Col. ARNOLD. I can not answer that question.

Mr. GOOD. I thought you had given a list of the stations.

Col. ARNOLD. No, sir; some of them are in the vicinity of those places I have mentioned.

Mr. GOOD. What is the least number of acres you can get along with at one of these stations? I am speaking of the coastal stations. As I understand it, the balloon stations are right at the fortifications?

Col. ARNOLD We never need more than 20 acres for our largest ones. We merely need enough ground to exercise the men or to drill the men, and to put the buildings on.

Mr. GOOD. You say the buildings are to be semipermanent?

Col. ARNOLD. Yes, sir.

Mr. GOOD. Take, for instance, the five sets of officers' quarters—what is the estimated cost of those quarters?

Col. ARNOLD. $97,500 for the five of them.

Mr. GOOD. And what is the estimated cost of the commanding officer's quarters?

Col. ARNOLD. $5,000. They are just frame buildings, with shiplap on the outside, painted, and plaster board inside. There is no plastering or decorating inside.

Mr. EAGAN. Is it planned to go on with the Pacific coastal stations at the same time you are constructing the Atlantic and Gulf stations?

Col. ARNOLD. Yes, sir; the 20 balloon companies include both the Atlantic and Pacific.

Mr. EAGAN. I mean the coastal stations. Is it planned to go on with them at the same time you are going on with the Atlantic and Gulf stations?

Col. **Arnold.** I can not answer that question, because we would have to get our instructions on that from the Secretary of War The only thing I can testify to is that if we build according to the program it will cost this much, and if we cut out any portion of it the amount needed will be proportionately decreased.

AIRPLANE STATIONS IN PANAMA.

Mr. **Borland.** You have estimated for the construction of four permanent stations in Panama, $5,420,000. Where are they located?

Col. **Arnold.** This same letter from the Secretary of War states.

> Aero squadrons, four in the Canal Zone and three in Hawaii. The further supply of aeronautical equipment to the Philippine Islands to be held in abeyance as prescribed in paragraph 1.

There has been a definite scheme for the aerial defense of the Canal Zone drawn up, which calls for the location of two squadrons at the northern end of the canal and two squadrons at the southern end of the canal. The sites are to be determined by the military governor of the Canal Zone. Of course, it is all Government land down there One site has been definitely located in what is known as Coco Solo on some land that has been filled in down there. On the Pacific side one site has been selected on what is known as the Balboa fill. I do not know whether the other two sites have been located or not, but it is up to the military governor of the Canal Zone as to where they are to be located.

Mr. **Borland.** Why are they estimated for at a higher cost than those in this country—four at $5,420,000?

Col. **Arnold.** In addition to the buildings that have been prescribed, there is one permanent supply depot, which is not included in the others, and one engine-repair depot. Then, the Canal Zone also includes one permanent balloon station. So you have those three items, which amount to $1,400,000, added.

SUPPLY DEPOTS FOR COASTAL STATIONS.

Mr. **Borland.** Why did you not have one permanent supply depot and one engine-repair depot in connection with the 16 coastal stations in continental United States?

Col. **Arnold.** Our general scheme of upkeep and maintenance of the stations here contemplates the establishment of certain supply depots and engine-repair depots throughout the United States at points where they can not only take care of the maintenance and upkeep of the interior stations, but also take care of the maintenance and upkeep of the coastal-defense stations. For instance, we have supply depots at Harrisburg, Richmond, Dayton, Ohio; San Diego and Americus, Ga. We are building one in California. Those supply depots will supply not only our land stations, but also our water stations. We are also building——

Mr. **Borland** (interposing). What is the purpose of those supply stations?

Col. **Arnold.** To supply our aviation stations with matériel necessary to run them.

Mr. **Borland.** Do they include engine-repair depots?

Col. Arnold. No, sir; I was just going to the engine-repair depots when you interrupted me. We have constructed engine-repair depots at Indianapolis, Dallas, and one in the Southeastern States—I am not sure whether it is at Montgomery or whether it is at Atlanta. In addition to that, we are going to put up an engine-repair depot at Los Angeles, Cal.

Mr. Borland. Why at Los Angeles?

Col. Arnold. It is a railroad center and has a good matériel market.

Mr. Borland. What stations have you adjacent to Los Angeles except San Diego?

Col. Arnold. San Diego and Riverside are both close to Los Angeles. In addition to that, if this scheme goes through, we are going to have another squadron at San Diego and an additional one at Los Angeles.

Mr. Byrns. Just what are these supply stations?

Col. Arnold. They are large warehouses in which all kinds of spare parts and supplies necessary for the maintenance and upkeep of aeroplanes are kept. As these stations need certain supplies, they requisition on the supply depots and the supplies are boxed up and shipped to the stations.

Mr. Slemp. I should think you would have one in the Northeast.

Col. Arnold. We have one at Harrisburg. We have not many stations in the northeastern States, and we have tried to arrange them where there are railroad facilities and also so that the number of stations they had to supply were about the same distance away.

COASTAL AIR STATION IN HAWAII.

Mr. Borland. You have an item here for the construction of three permanent stations in Hawaii, $4,420,000. Where are they to be located?

Col. Arnold. On Fords Island. This island has already been rented by the Government, but I doubt whether there has been any construction work started at all. We already have one squadron in camp there.

Mr. Borland. On Fords Island?

Col. Arnold. Yes, sir.

Mr. Borland. In Pearl Harbor?

Col. Arnold. Yes, sir.

Mr. Borland. Where are the other two to be located?

Col. Arnold. They will be located by the department commander out there, so that I am unable to give you the exact location.

Mr. Borland. The estimate is $4,420,000.

Col. Arnold. That includes a supply depot, a repair depot, and a balloon depot.

Mr. Slemp. How many balloons are in a balloon squadron?

Col. Arnold. Each company has at all times two balloons—one balloon up in the air and another balloon in reserve—and a squadron is composed of four companies.

* * * * * *

FRIDAY, MAY 31, 1918.

PANAMA CANAL FORTIFICATIONS.

STATEMENT OF MAJ. GEN. WILLIAM M. BLACK, CHIEF OF ENGINEERS, ACCOMPANIED BY LIEUT. COL. J. M. WRIGHT, CORPS OF ENGINEERS, AND OF COL. W. F. HASE, ACTING CHIEF OF COAST ARTILLERY, ACCOMPANIED BY LIEUT COL. C. E. BRIGHAM, COAST ARTILLERY CORPS.

MAINTENANCE OF CLEARINGS AND TRAILS.

Mr. BORLAND. Gen. Black, it has been suggested by the chairman of the Committee on Appropriations that the items relating to the fortification of the Panama Canal should be transferred from the sundry civil bill, where they have heretofore been carried, to this fortification bill, and it is on those items that the committee has asked you to appear to-day. The first item is for maintenance of clearings and trails. You had in 1918 $20,000 for this purpose.

Gen. BLACK. Yes, sir. Our regular estimate for 1919 was $20,000 and we have submitted a supplemental estimate of $30,000, making $50,000 in all. I suppose you are quite familiar with the conditions in the Panama Canal Zone, and you know how quickly the vegetation grows up.

Mr. BORLAND. Yes.

Gen. BLACK. If a place is not kept continuously cleared, the jungle grows up so as to make movement almost impossible. This increased appropriation is necessary because, being in a state of war, we have to make for the defensive lines increased clearings which in time of peace are not necessary. These defensive lines are for the defense of the canal and of our outlying works, such as the observation stations, searchlights, and things of that sort. The trails are those that it is necessary to keep up for the movement of troops.

Mr. BORLAND. The trails, then, lead to these outside defensive lines, as you refer to them—your searchlight stations and your fire-control stations, and places of that kind?

Gen. BLACK. Yes, sir. In addition there are some communicating trails between the camps and the permanent roads of the district. It is anticipated that if the enemy should attempt to make a landing it would be at certain definite spots. There are not so very many places where he can land, and these trails lead toward those places. I included that in my reference to the defensive lines.

Mr. BORLAND. It has been supposed, General, that to quite a considerable extent the growth of the jungle was a matter of defense.

Gen. BLACK. That is a mistake. I can readily see how that comes about, but I think there is one little statement I may make that would show you the fallacy of that. We necessarily will have a comparatively small body of men on the Isthmus. They will have to defend wherever the enemy attacks. The enemy has the choice of positions for attacking, and we have to be able to move that small body of men on interior lines and move them quickly, so as to head the enemy off. It has been proven that you can penetrate anywhere without making a trail. A few men going ahead with machetes can get a body of troops through if you give them a chance.

Mr. BORLAND. That is rather slow work, is it not, General?

Gen. BLACK. It is fairly slow, and yet faster than you would think. A great deal of that growth, Mr. Borland, is a sort of cane, and it would be like going through a cornfield where the stalks of corn are about 6 inches apart everywhere without being in rows. It is not pleasant to walk through even after you have chopped off the cane.

Mr. BORLAND. A few years ago you had some kind of a test, as I understand it, in making trails through the jungle?

Gen. BLACK. Yes, sir.

Mr. BORLAND. And under test conditions, with ample force and knowing just where you were going, some record was made, but I have forgotten just what it was.

Gen. BLACK. I have also forgotten the exact amount.

Mr. BORLAND. And everybody assumed that that was not the normal or usual rate of speed that could be obtained in cutting a road through the jungle?

Gen. BLACK. No, sir.

Mr. BORLAND. And anything very much slower than that would put an enemy at great disadvantage?

Gen. BLACK. That idea of depending on the jungle for defense was one which I never subscribed to, because I had to go through too much of it myself before we had any trails at all. You know I was in Panama for 15 months just before the Americans took possession. I went down there in April of 1903 and returned in July of 1904, and learned during my stay that that was no defense. Then these maneuvers were held about three years ago just to test out the idea, and it was proved conclusively that troops could get around and go forward.

In all landing operations, after an enemy has once consolidated his position ashore, which is the term we use, it is a very difficult thing to dislodge him; but if you can get to him before he can get many troops ashore, it puts him at a tremendous disadvantage. Therefore, not knowing exactly where he will land, because there is no way of discovering that, these likely spots will all be watched and connected with field telephones. The defending troops will be concentrated at some point in the rear and will be able to get to those points as soon as the first notice of a landing comes. If we have the trails we will get there before the enemy can get his positions ashore consolidated.

Mr. BORLAND. Have you a plan laid out that you work to in reference to these roads and trails?

Gen. BLACK. Yes, sir.

Mr. BORLAND. Do you attempt to keep certain roads and trails open each season?

Gen. **Black**. Yes, sir.

Mr. **Borland**. How is that work done?

Gen. **Black**. Partly by the hired labor and partly by the labor of troops; mostly by hired labor, because it is not a good thing to use troops on that kind of work. If you do they will not get the necessary training.

Mr. **Borland**. Your $20,000 annual appropriation has been sufficient heretofore?

Gen. **Black**. Well, hardly. We had on the 30th of April $53.53 left, and will have to go through May and June with practically no money. Of course that appropriation was for peace time conditions, and the matter was not so pressing then as it is now.

Mr. **Borland**. We entered this war soon after the passage of the last bill.

Gen. **Black**. Yes; in April of last year, but the estimates were made up long before that.

Mr. **Borland**. And you have run through practically this fiscal year on the $20,000, which was the first year of the war?

Gen. **Black**. Yes, sir; but we have done it in a very unsatisfactory manner. Of course, as we have not been attacked there have been no bad results thus far. We can not spend more than we have. We are fortunate in that there has been no attack, but we did not get the work done.

Mr. **Borland**. I imagine if there were an attack or the probability of an attack you would have to suddenly commandeer labor and go to work and do what was necessary in that respect and in a good many other respects.

Gen. **Black**. Yes; with the same disadvantage we are having now in hurrying up our work. We do not get it done in time.

Mr. **Borland**. Now, in reference to the $30,000 supplemental estimate, how do you account for that?

Gen. **Black**. The various items are not specified.

Mr. **Borland**. Who made up that estimate?

Col. **Wright**. The estimate came from the Isthmus, and the district engineer advises us that it covers additional work which the department commander thinks essential in order to make him properly prepared to conduct the defense of the canal.

Gen. **Black**. The commanding general, you know, is one of the officers who went over with Pershing. He came back to this country about three months ago and is now on the Canal Zone. He was also active down on the Texas frontier.

Mr. **Borland**. Have you anything to show how many miles of roads and trails are contemplated?

Gen. **Black**. Nothing for this supplemental estimate. We have for the other estimate.

Col. **Wright**. The $20,000 estimate is based on clearing 3,633 acres and maintaining trails of a total length of 73.4 miles. That provides only for the maintenance of those trials and clearings which we had previously. The foundation of this $20,000 estimate is exactly the same as for the $20,000 appropriation which you gentlemen made in the last bill.

Gen. **Black**. The clearing is at $5 an acre and the trails at $25 a mile.

Mr. **Byrns**. General, you have had trails to all these points you have mentioned, have you not, up to this time?

Gen. BLACK. No, sir; we have had some, but not all.

Mr. BYRNS. I thought this increased appropriation was just to enlarge your clearings.

Gen. BLACK. It is to make some new ones also. Unfortunately, we have not been able to get from Panama the detailed information that we wanted to give you, so that I can not state definitely where all this is to go. We can tell you where a great deal of it is.

Mr. GOOD. General, there has been quite a wide difference in the amount appropriated each year for this purpose?

Gen. BLACK. Yes, sir.

Mr. GOOD. I notice that in 1915 the appropriation was $21,900; in 1916, $45,000; in 1917, $30,000, and in 1918, $20,000. What is the reason for that difference?

Gen. BLACK. I think that must have been due to the way the committee felt about it, because the estimates run about the same. I do not know any other reason.

Mr. GOOD. You had the same number of miles of trails to maintain?

Gen. BLACK. At first the maintenance was very difficult and expensive.

Mr. GOOD. Is it necessary to do about the same amount of work each year on every mile of trail?

Gen. BLACK. No, sir. Some of these trails have been improved by using cobblestones. After that has once been done, and the trail finished, only light clearing is necessary, all of the heavy clearing coming at first. There is a cane growth that comes up wherever it has a chance, but it can be cut off very easily by a man with a machete.

Mr. GOOD. To what extent is that paving a part of the entire project of your trails and roads?

Gen. BLACK. It is really a very small part of it, because the paving is simply put in where the ground is very soft. The word "paving" is, perhaps, not the proper term.

Mr. GOOD. I understand the nature of it.

Gen. BLACK. Its purpose is to prevent the soft spots from becoming too deep in the rainy season.

Mr. GOOD. Is it planned to put cobblestones on all of these trails?

Gen. BLACK. No, sir; only where necessary. Where we make a permanent road we will have to put in paving of some kind so that the road will not wash out.

Mr. GOOD. How much of the amount you are asking for next year, $50,000, is to be expended for the purpose of putting in permanent trails?

Gen. BLACK. They are all permanent trails, but not permanent roads. That is another project entirely.

Mr. GOOD. Then the trails are not all made of cobblestones?

Gen. BLACK. No; the cobblestones are only used in impassable places. For instance, a trail may go through a piece of lowland, where there is marshy soil. There you have got to put something in to maintain the trail. It is what we would call here a dirt road, except that there it is not even graded or drained, but simply opened up.

Mr. GOOD. For 1918 and 1919 your original estimates were only $20,000. Is it the opinion of the Engineer Department that these trails can be maintained and clearings made for $20,000 a year?

Col. WRIGHT. If I may, I would like to read from last year's hearing:

> The CHAIRMAN. The first item is for maintenance of clearings and trails. The estimate is $20,000, and the appropriations last year was $30,000.
>
> Gen. BLACK. Yes, sir; we are cutting the amount down. As these trails are maintained they get easier to maintain each year, and we can cut the amount down.
>
> The CHAIRMAN. How many miles of trails have you?
>
> Gen. BLACK. This includes not only the trails, but the clearings around the fortifications.
>
> Col. WINSLOW. Three thousand six hundred and thirty-three acres of clearing at $5 per acre, and 73.4 miles of trails at $25 per mile. The total adds up $20,000. This is a continuation of the work that was previously done by the canal authorities, and which is now being carried on by the Engineer officer stationed on the Isthmus.
>
> The CHAIRMAN. Will it take this much money every year to keep up the trails?
>
> Gen. BLACK. You will notice that we have cut down the appropriation by $10,000 from last year, and we hope we will continue to cut it down gradually, but this jungle stuff grows very rapidly, and required continuous work to keep it down.

Our original estimate this year was exactly the same as last year, and had exactly the same basis as the estimate which we submitted last year. If the additional $30,000 is appropriated it will be used for the purpose of doing additional work which the commanding general considers necessary on account of war conditions.

Mr. GOOD. The $30,000 additional is for work made necessary by war conditions?

Gen. BLACK. That is the statement of the commanding general.

Col. WRIGHT. It provides for additional clearings and trails which he considers essential.

Mr. GOOD. Otherwise it would be the announcement of a new policy, because last year you said you expected to reduce the amount.

Gen. BLACK. That is correct, but you will find that in some places, on account of the war, the appropriations have had to be increased.

PROTECTION, PRESERVATION, AND REPAIR OF FORTIFICATIONS IN PANAMA.

Mr. BORLAND. The next item is for "Protection, preservation, and repair of fortifications, including structures erected for torpedo defense and for maintaining channels for access to torpedo wharves." The estimate this year is $25,000 and you have $25,000 more in a supplemental estimate, while the appropriation last year was $10,000.

Col. WRIGHT. We had $10,000 last year in the regular appropriation bill. In addition to that we have secured an allotment of $6,366 from the Coast Artillery, who are handling the appropriation for contingent expenses; we also secured a deficiency appropriation of $9,400 in the act of March 28, 1918. We have thus had at our disposal during the fiscal year a total of $25,766. Of that amount there was an allotted balance on April 30, of $9,386.78, and there was no unallotted balance. You will see that up to April 30 we had spent for purposes of preservation and repair approximately $16,400 during the fiscal year. To care for the work during the remainder of the fiscal year we have this allotted balance of approximately $9,400. Included in the work for the remainder of the fiscal year is a single item of $5,000 which has come about on account of the necessity of repairing the concrete steps on Flamenco Island which have been slipping as a result of the torrential rains. That work, according to the report of the district engineer, is to go forward during the months of May and June, and will in all probability be completed during those months. That will make a total expenditure during the present fiscal year of about $21,000, in addition to such items of ordinary preservation and repair as may come up during the months of May and June, 1918. So that our expenditures during the present year will certainly be as great as $21,000 and will in all probability be greater than that to some extent, though just how much greater I can scarcely predict. In our estimate for next year the district engineer has included a single item of $24,000 for the purpose of painting the batteries at both ends of the Canal. In our previous preservation and repair appropriations we have not had sufficient money to attack this work at all, and the batteries have not been painted since the completion of the construction work. If that item be added to the money which we have already spent this year you will find the total to be $45,000. Our estimate has been placed at $50,000 in order to cover additional contingencies which may come up. The exact itemization of that I can give you if it is desired.

Mr. BORLAND. Your money is spent largely for materials, paint, and so on?

Col. WRIGHT. To some extent; yes, sir. It is the policy of the War Department to use the labor of troops as far as possible in maintaning the fortifications, and in so far as that is possible the Engineer Department will supply the materials which it will be necessary for the troops to use in this work. Of course, a great deal of work will come up which it is neither possible nor desirable for the troops to do, and in those cases the Engineer Department must furnish both material and labor.

Mr. GOOD. How does your investment there compare with your investment in the Philippines.

Col. WRIGHT. The total investment at the Panama Canal for Engineer Department work on fortifications is in the neighborhood of $6,000,000. I can not say as to the Philippines. At El Fraile alone the Engineer Department work is about $2,300,000.

Gen. BLACK. Does that include the turrets?

Col. WRIGHT. No, sir.

Gen. BLACK. In addition to that there are the fortifications on the other islands. The Philippines will probably amount to more than Panama.

Col. WRIGHT. The total expenditures on Carabao Island are in the neighborhood of $1,500,000.

Mr. GOOD. You have never had more than $15,000 in the Philippines, and never more than $7,500 in the Hawaiian Islands.

Col. WRIGHT. That is true, sir; but you will remember that when I appeared before the committee about two weeks ago I made pleas for large increases.

Mr. GOOD. I know you did, for this year.

MAINTENANCE, REPAIR, ETC., OF SEARCHLIGHTS AND LIGHT AND POWER PLANTS.

Mr. BORLAND. The next item is for "Maintenance and repair of searchlights and electric light and power equipment for fortifications, and for tools, electrical and other supplies, and appliances to be used in their operation."

Col. WRIGHT. The appropriation for the maintenance and repair of searchlights for 1918 was $7,500. Of that amount we had an available balance on April 30 of $1,176.93. The difference between between those two sums does not in any way represent the total amount of money which has been spent on the maintenance of searchlights and electrical equipment on the Panama Canal during that part of the fiscal year which is past. A few years ago you gentlemen made an appropriation for reserve equipment for the Panama Canal totaling about $50,000. The purpose of that reserve equipment appropriation was to provide a supply of stores and spare parts which should be accumulated in the coast defenses of the Panama Canal, to be used in case the canal were cut off from communication with the United States. That supply is supposed to be sufficient to provide for the maintenance of the electric plants, searchlights, etc., during the period for which it is probable the canal may be isolated.

Exactly similar appropriations have been made in the cases of the Hawaiian Islands and the Philippine Islands. This reserve equipment has always been considered by the district officers as a war reserve and is not drawn on except in very great emergencies. In such cases replacement orders are immediately forwarded to the United States, the idea being that the reserve should be kept as nearly intact as possible. During the current fiscal year the demands on the district engineer for the maintenance of searchlights and electric light and power equipment at the canal have been very considerably in excess of the money which he has had at his disposal, on account of the fact that the installations have been operated very much more than has previously been the case. On account of the necessity of keeping watch over the harbors of Colon and Balboa, five searchlights have been operated nightly ever since the war began. In addition to that there have been extra drills, which have been held, of course, in order to make sure that the personnel is up to the top notch of efficiency.

All of these things have caused a very considerable increase in the amount of supplies which have been used, and it has been found necessary to draw upon this reserve stock. The last data which was received with regard to the extent of the withdrawals from the reserve stock stated that up to January 23, 1918, they amounted to $3,251.13, and the statement was made that the expenditures for the remainder of the fiscal year for supplies, including the withdrawals from the war reserve stock to be made in the time would be approximately $5,748.87. Recommendation was made that on this account we secure a deficiency appropriation of $9,000 in order to permit the replacement in the reserve stock of the articles which had been withdrawn, and to cover expenses until the commencement of the fiscal year 1919.

Mr. GOOD. From what fund do you get your war reserve stock?

Col. WRIGHT. That is purchased from reserve equipment, which is a separate appropriation of $50,000 made a few years ago. There thus appears an expenditure during the fiscal year 1918, for the maintenance of these searchlights, of about $16,500, made up of the desired deficiency appropriation of $9,000, and the regular appropriation of $7,500. In accordance with the recommendation from the Isthmus we submitted to the Secretary of War a deficiency estimate in the sum of $9,000 for this purpose, but the Secretary stated that inasmuch as many deficiency estimates had been submitted to Congress recently, and the chairman of the Committee on Appropriations had had considerable difficulty in defending such estimates on the floor of the House, he did not desire to forward any further deficiency estimates. For that reason we are deprived of the $9,000, which we had hoped to get. On that account we will expend the entire amount of $7,500, which we had in the regular estimate, and will also deplete our stock of reserve parts on the Canal Zone by a very considerable amount. As I told you previously the total amount that we will spend for the maintenance of that equipment during 1918, counting the supplies withdrawn from the reserve, will amount, according to the estimate of the district engineer, to $16,500. We are asking you this year, in our estimates thus far submitted, for $15,000, which, according to the experience of the present year, will cover only the regular maintenance of equipment. So we will at the same time carry over this accumulated deficiency in the reserve equipment. Now, we would like to ask you gentlemen to give us not only the $15,000 for which we have estimated, but to increase that $15,000 in order to enable us to replace in the reserve equipment the parts which we have had to take from it this year in order to get through.

Mr. BORLAND. You have only estimated for the $15,000.

Col. WRIGHT. That is all, and we were not allowed to submit the deficiency estimate.

Gen. BLACK. We were not allowed to submit it, and it was not permitted because of the desire of the Secretary of War not to send in any more of these deficiency estimates. However, the Chief of Staff told us if we could get our appropriation increased, to do so.

Mr. BORLAND. I notice that in the Hawaiian Islands, where you have had $2,500 for the maintenance and repair of searchlights, etc., you doubled the amount and made an estimate of $2,500 more.

Col. WRIGHT. Yes, sir.

Mr. BORLAND. Is it true that at all of these places you are using your searchlights to a greater extent during the war than during peace times?

Col. WRIGHT. Yes, sir; to a very much greater extent.

Gen. BLACK. Not only for drills, but also, in the case of the Panama Canal, for the purpose of keeping a watch against the positive peril of a German raider or submarine. These have been reported in that section from time to time, and a greater degree of watchfulness is required there than in either the Hawaiian Islands or the Philippine Islands.

Mr. GOOD. What is the state of your balances in the appropriation for reserve stock at the Panama Canal?

Col. WRIGHT. We have a balance of allotments amounting to $3,720.35 and no unallotted balance; approximately $46,000 has been expended, and the $3,720 is needed in order to complete the project for the reserve equipment, which is deficient in a few items.

Mr. GOOD. What were the total allotments under that appropriation during the present fiscal year?

Col. WRIGHT. I can not give you that, sir. I think the allotment was made some time ago and has been spent by the Engineer Department from time to time as it became possible to secure the parts.

Gen. **Black**. We can answer that when the record comes to us.

An allotment of $50,000 was made to the Engineer Department March 11, 1916, for reserve equipment for the Canal.

Col. **Wright**. The entire $50,000 has been allotted, but I can not state exactly when that allotment was made.

CONSTRUCTION OF SEACOAST BATTERIES.

Mr. **Borland**. The next item is "for the construction of seacoast batteries."

Gen. **Black**. I will have Col. Wright explain the original estimate and first supplemental estimate, and I will take up the second supplemental estimate.

Col. **Wright**. The balance from "Seacoast batteries, Canal Zone," was on April 30, $71, 081.11, that being the allotted balance. There was also an unallotted balance of $773.63. The original estimate submitted was in the sum of $290,000. That estimate contemplated the expenditure of $210,000 for the completion of the four 12-inch gun emplacements which are being constructed between Fort Sherman and the Chagres River. It also contemplated $80,000 for the provision of quarters for the employees of the Engineer Department on the Canal Zone. The first supplemental estimate of $61,700 it was intended to apply entirely to the further provision of these quarters, the increase in the estimate for quarters being necessitated by the increased cost of labor and material and by the fact that quite a lot of municipal work in the way of construction of roads, walks, sewers, water systems, electric conduits, grading, etc., was found necessary, the $80,000 covering the construction of the bare quarters. That is the explanation of the first two items, and Gen. Black will take up the third.

Mr. **Borland**. Colonel, you say that $210,000 of that estimate of 1919 was for the emplacements for the 12-inch gun batteries?

Col. **Wright**. Yes, sir.

Mr. **Borland**. Are the 12-inch guns ready?

Col. **Wright**. The 12-inch guns are ready. The guns to be mounted here are spare guns which have been in stock quite a long time at the Sandy Hook Proving Ground.

Gen. **Black**. Has there been no talk of shifting those?

Col. **Wright**. None whatever. These are two of the 12-inch long-range batteries that we talked about when the regular bill was under discussion two weeks ago.

Mr. **Borland**. Have the emplacements been begun?

Col. **Wright**. Yes, sir; the emplacements are under way at the present time.

Mr. **Borland**. How far have they progressed?

Col. **Wright**. On April 30, in the No. 2 battery, 7,259 cubic yards of concrete had been laid; 2,190 cubic yards of rock excavation and 65,562 cubic yards of earth excavation had been accomplished and 33,205 yards of back fill had been placed. In addition, a large amount of work in connection with sewers, drains, conduits, water supply, etc., had been carried on at these emplacements. The batteries were originally planned to control the water area at the mouth of the Chagres River, and are situated some 4 miles from Toro Point.

between Fort Sherman and the Chagres. In order to transport construction materials to the site a railroad from Toro Point to the batteries was necessary. This railroad is estimated to cost a total of $264,300. The railroad at present is practically completed and it is evident that a large amount of the money which has thus far been expended has gone into this railroad which is in the nature of construction plant necessary before the actual emplacement work can be carried on at a rapid rate.

Mr. BORLAND. What I was trying to arrive at was the prospect for continuing and completing the work of emplacement this fiscal year, 1919.

Col. WRIGHT. I think it is safe to say that both batteries will be completed in the fiscal year 1919.

Mr. BORLAND. And also have the guns mounted in them?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. Because if they are not completed in the fiscal year 1919 with reasonable prospect of having the guns mounted, it will be just as well to defer them as not necessary work at this time.

Col. WRIGHT. These are 12-inch long-range batteries, of which we have several under construction at present, and are among those furthest advanced. We have every expectation of completing them by the last of July, 1919.

Mr. BORLAND. Now, tell us about these quarters. Are they quarters for the Coast Artillery?

Col. WRIGHT. No, sir. On July 1, 1916, fortification construction in the Panama Canal Zone, which had previously been carried on by Panama Canal forces under the supervision of Panama Canal officials was transferred to the Engineer Department, and the district engineer officer at Balboa was put in charge of all fortification work on the Canal Zone. At that time certain employees who had previously been used by the Panama Canal on fortification construction, and were experienced men in that sort of work, were transferred to the Engineer Department. Since that time these employees, while not employees of the Panama Canal, have been occupying Panama Canal quarters. Their occupancy of these quarters has been entirely by sufferance. The Panama Canal authorities state that their supply of quarters is not equal to the demand that is made on them by their own people, and they are stretching a point in permitting our employees to occupy Panama Canal quarters. We wish at the present time to construct quarters for our employees which shall be independent of the Panama Canal quarters and will render it unnecessary for us to depend further on the Panama Canal to furnish quarters for our men.

Mr. BORLAND. These are Engineer Department quarters that you are going to construct?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. How much are you going to spend for that purpose?

Col. WRIGHT. $141,700.

Mr. BORLAND. And how many quarters will that provide?

Col. WRIGHT. That will provide a total of 25 sets of family quarters and 24 sets of bachelor quarters—13 buildings in all. It will also provide an office building at Cristobal for the district engineer, whose only office at present is at Balboa Heights, and will provide for the necessary municipal work—roads, walks, sewers, water systems, etc., which we must put in in connection with these quarters. It also covers the necessary surveys.

Mr. BORLAND. Where are they to be constructed?

Col. WRIGHT. They are to be constructed at Ancon and at Cristobal. Our fortifications, as you know, are at the ends of the canal.

Mr. BORLAND. And this is solely for your civilian employees engaged upon this construction work?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. How long do you expect to use these quarters?

Mr. WRIGHT. As long as fortification construction and fortification maintenance form a necessary part of the canal work.

Mr. BORLAND. You do not mean fortification maintenance?

Col. WRIGHT. Our force will be largely reduced, of course, if we arrive at a point where no more fortification construction is being carried on.

Mr. BORLAND. Of course.

Col. WRIGHT. However, these employees are also being used for the land defense clearings and all that kind of work in addition to the seacoast fortifications.

Mr. BORLAND. Are all these people on the gold roll?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. None of them on the silver roll?

Gen. BLACK. We have laborers on the silver roll, but they would not be provided with quarters.

Mr. BORLAND. I refer to the people for whom you are requesting quarters.

Col. WRIGHT. Under present arrangements our silver employees for fortification work are secured from the labor forces of the Panama Canal. We furnish the supervision.

Mr. BORLAND. How much of a gold-roll force have you there now on construction work?

Gen. BLACK. Mr. Borland, I would like to look that up and insert the correct number later.

(This information is not now available. Cabled request for it has been sent to the Canal Zone and it will be communicated by letter as soon as received.—J. M. Wright.

Mr. BORLAND. In your original estimate you carried $80,000 for this purpose, and in your supplemental estimate $61,700, which is embraced in House Document 854, which is for an additional amount for this same purpose, making the total amount required for quarters $141,700.

Col. WRIGHT. That is correct.

Mr. BORLAND. Now the question is whether we want to enter upon the policy of providing these quarters, which is a brand new proposition.

Gen. BLACK. Would you call it that?

Mr. BORLAND. Well, is it not?

Gen. BLACK. No, sir. When we began to construct the canal. and, in fact, when the French began to construct a canal, they found they had to construct quarters for their employees. That policy has been continued all the time we have been down there. We have to construct quarters for all employees we have in Panama.

Mr. BORLAND. General, is not this the state of affairs: When we were in the construction stage on the Panama Canal it was necessary to create a construction camp on a very large scale, which included the construction of quarters for both the gold employees and the silver employees and all the managing officers, executive officers, Army officers, and everybody else.

Gen. BLACK. Yes, sir.

Mr. BORLAND. Because there were not quarters at all within reach for such a vast army of employees?

Gen. BLACK. Yes, sir.

Mr. BORLAND. That was a pure construction proposition and was preliminary to any construction of the canal. When the time came for turning the canal over to permanent management, the construction force was disbanded and an operating force was organized. Then so far as this committee was concerned, at least, we did not attempt to provide quarters for that operating force.

Gen. BLACK. They had them.

Mr. BORLAND. But an application was made to the committee to provide quarters for the gold employees upon a very attractive proposition, that the employees could not find proper quarters in the vicinity and would be glad to pay a fair rental or an interest value on the investment which the Government would make there for their benefit; and upon the strength of that sort of a hearing, this committee did appropriate something like $2,000,000 for the permanent operating force, upon the distinct understanding they were to rent these quarters upon a very reasonable rent—just simply a small interest charge and amortization and upkeep. Soon after that, however, an agitation was started, very much to the surprise of the committee and everybody else, to give these quarters free to those employees upon the ground that in some way or other they were being unjustly discriminated against as against the construction employees in the temporary force. No emphasis in that agitation was laid at all upon the fact that these men were a permanent operating force, on the same basis as the civil-service employees in the United States everywhere; and that they were not on the temporary basis of men who had to be induced to go down there to take a temporary job, at perhaps a sacrifice of other opportunities back home. No emphasis was laid upon that question of the permanency of their positions. This agitation resulted in considerable trouble for the committee. The committee did not change its attitude. It insisted the investment had been made upon the distinct, clear-cut understanding that the employees were to pay for their quarters; but an Executive order finally was issued to extend the time at which these men would have to pay for their quarters, and I think it has been extended from time to time and perhaps now it has been extended indefinitely, and they are not paying for the quarters. We have been asked since then to provide quarters for the silver employees, and very naturally, fearful that the same result would occur, the committee has not provided them with quarters. We do not care to make an investment there with the idea that the Government is going to get a return on it and then find out that there is to be no return on the investment and that it is to be a dead expense. Now this is the same proposition.

Gen. BLACK. Yes, sir.

Mr. BORLAND. The only difference, as I understand it, is that your force is somewhat discriminated against or at a disadvantage because they find themselves side by side with men who are enjoying that particular advantage.

Gen. BLACK. That is one difficulty.

Mr. BORLAND. Is not that the only difficulty?

Gen. BLACK. No, sir; that is not the only difficulty. The civil employees can not get decent quarters down there. It is a permanent loss to the Government to go on as you are doing now. It does not make any difference whether you pay a man $2,500 out of which he has got to pay $900 for a house, or whether you give him the house and pay him $2,500 minus the $900.

Mr. BORLAND. But it makes a whole lot of difference whether you pay him $2,500 and a house or $2,500 and charge him rent for a house.

Gen. BLACK. Yes; but by furnishing the house the United States can save more than it would have to pay the employee if he had to rent a house, because unless his quarters are supplied to him the United States has got to pay him enough to give him a fair living salary plus a big rental which he would have to pay to somebody who owned the house.

Mr. BORLAND. Now, let us see about that. This work is primarily construction work, constructing these sea-coast batteries, and you have a force of mechanics and civilian employees there for that purpose. When these 12-inch batteries are constructed and such other batteries as are yet unfinished, then your force necessarily would be only for the maintenance of the batteries.

Gen. BLACK. No, sir; we have a great deal of work outside of that. In part this force is used for work that goes on year in and year out such as maintenance work and the general work of the Engineer Department.

Mr. BORLAND. But you would not need as large a force after the construction of the batteries had been finished as you do now.

Gen. BLACK. Pretty nearly. For a good many years we will probably have about the same number of high-grade men. The low-grade men will go. There is no question of that. It is just as it is in our districts where the permanent office force changes very little. The amount of work changes from time to time and we simply alter the laboring force to meet the changes. We have what you may term an irreducible minimum which is kept on all the time in our district offices.

Mr. BORLAND. But your force of mechanics——

Gen. BLACK (interposing). The mechanics shift.

Mr. BORLAND. Your force of mechanics is not comparable to your office force. They are very much larger when you have construction work than when you do not.

Gen. BLACK. Yes, sir. For instance, we show in the Book of Estimates under the item, "Preservation and repair of fortifications," page 2, 15 permanent employees. There are 351 temporary employees under this item.

Mr. BORLAND. If we provide housing facilities for these people, will there not be some danger that there will be a temptation to keep them there from year to year?

Gen. BLACK. No; I think not. The temporary people are not people whom we would keep. I do not think there is any danger.

Mr. BORLAND. This involves the building of roads, sewers, schoolhouses and the establishment of a community settlement, does it not?

Gen. BLACK. Yes; except the schoolhouses. They will use the schools that have already been provided.

Mr. BYRNS. Do I understand that these quarters are to be put up and furnished to the employees free of any charge or without the payment of any rent?

Gen. BLACK. You can give them a salary large enough to charge them rent, in which case the rent will be much less than they would have to pay for similar accommodations elsewhere.

Mr. BYRNS. They are getting a salary now, I take it, which is commensurate with what they are doing.

Gen. BLACK. That is as it may be. It has been awfully hard to get draftsmen to go to Panama, and in many cases we have simply had to order a man to go and say to him practically, "You must leave your station here in the United States and go to Panama or you will be out of a job."

Mr. BYRNS. General, if these quarters were put up, would not necessarily the same condition prevail with reference to these houses as prevailed with reference to the houses to which Mr. Borland referred a while ago; in other words, you could not have a different system there on the canal and have certain employees getting their rent free and other employees who were working right alongside of them paying for their quarters?

Gen. BLACK. The salaries would have to be adjusted accordingly. For instance, in fixing a man's salary you fix it usually at the rate you pay in the United States plus a certain percentage. You can adjust that by taking off a fair rental. There is no intention of making any increase in salaries at all. The intention is to make these places sufficiently attractive so that we can get a good class of men to go to Panama and stay there.

Mr. BYRNS. As a matter of fact, it would be an increase of salary, in effect, if you furnished them a house plus what you are giving them now?

Gen. BLACK. Yes, sir; that would be true.

Col. WRIGHT. It is not an increase of salary, because they are getting quarters to-day.

Gen. BLACK. Some of the men are.

Col. WRIGHT. Which they are going to lose.

Mr. BORLAND. What makes you think they are going to be thrown out of their quarters?

Gen. BLACK. We are so informed.

Col. WRIGHT. That is what the Panama Canal authorities say, and they own the houses.

Mr. GOOD. Does the Engineer Department do any other work in connection with the canal aside from the engineering work for the seacoast fortifications?

Gen. BLACK. The representative of the Chief of Engineers in Panama is our district engineer, and if any question of river and harbor improvement were to come up, he would handle it. He does not have that work now, but as department engineer he does have a good deal of work in connection with military mapping and the maintenance of military roads and other military work.

Mr. GOOD. Then practically all of your work is in connection with these emplacements?

Gen. Black. It is all in connection with the defense of the Panama Canal.

Mr. Good. As I understand it, you propose, if this estimate for emplacements is granted, to complete that and have these 12-inch guns mounted within a year from now?

Gen. Black. Yes.

Mr. Good. Which practically completes the present plan for emplacement work in Panama, does it not?

Gen. Black. Oh, no, sir; there are 16-inch guns proposed for both ends of the canal.

Mr. Good. Emplacement work has not been completed for those?

Gen. Black. It has not even been started, We have not even designed the batteries, because we do not know how the guns are to be mounted, and we have been told that for the present, inasmuch as there is such a strain on the productive capacity of our country, no 16-inch gun work will be done, and our estimate for 16-inch gun emplacements will be simply dropped for the time being.

Mr. Good. When we were at work on the canal, it occurred to me that we had several villages of houses and quarters down there for the men.

Gen. Black. We had.

Mr. Good. What has become of all those quarters?

Gen. Black. I do not know. I never have understood that. I know I appealed to two successive governors to let me have some quarters for our employees, and in vain. He told me they could not be spared. As a matter of fact, there never have been enough quarters for all the gold employees.

Mr. Good. But you have been taking some of them away and tearing some of them down and now you are asking money to build them again.

Col. Wright. This is for an entirely different type of quarters.

Mr. Good. What is the difference?

Col. Wright. The quarters that were originally built on the Canal Zone were not of a permanent type.

Mr. Good. Do you now propose to build permanent quarters?

Col. Wright. Yes, sir; we propose to build permanent quarters, following exactly the method which the canal authorities have used in building quarters for the operating force.

Mr. Good. Colonel, will you put in the record a statement of what it is proposed to build and the cost of each type of structure?

Col. Wright. Yes, sir.

The quarters to be constructed for engineer employees engaged on fortification work at the Panama Canal are as follows:

Ancon:	
2 type 17 (1 story, 1 family)	$7,562.00
1 type 14 (2 story, 4 family)	8,250.00
1 8 set bachelor	12,375.00
Cristobal:	
3 type 17 (1 story, 1 family)	11,343.75
4 type 14 (2 story, 4 family)	33,000.00
2 8 set bachelor	24,750.00
1 office building (for district engineer)	6,875.00
Necessary extensions of roads, walks, sewers, water systems, electric conduits, grading, etc	34,544.25
Surveys, plans, and records	3,000.00
Total	141,700.00

Mr. **Good**. Will this estimate include the office building?

Col. **Wright**. Yes, sir.

Mr. **Good**. How large an office building?

Col. **Wright**. It must be a comparatively small building, as the total estimate for it is less than $7,000. You can understand, of course, that the district engineer having his main office at Balboa, at the Pacific end of the canal, must also maintain an office at Cristobal in order to supervise the work which occurs at the Atlantic end of the canal.

Mr. **Good**. Have you any data showing the number of quarters existing now on the Canal Zone under the canal management?

(This information can not be obtained except from the authorities on the Canal Zone.)

Gen. **Black**. I presume we could get it if we have not got it now. Last year you remember you did supply quarters, and very nice ones, for the ordnance people down there.

Mr. **Borland**. I would like to have you advise the committee as to what was done with the appropriation of $332,000 made in 1918.

Col. **Wright**. The $332,000 was added to the $400,000 which had been appropriated by a previous act. The work that has been done with the entire amount has been the construction of the four 12-inch long-range guns west of Toro Point, and the construction of eight emplacements for antiaircraft guns.

Mr. **Borland**. What is the stage of completion of those guns on Toro Point?

Col. **Wright**. For the No. 2 battery the necessary camps have been constructed, clearings and excavations made, concrete plants are installed and the construction is under way. For the No. 1 battery the clearings and excavations have been made and a comparatively small amount of concrete work has been done. The No. 2 battery, however, is very well along.

Mr. **Borland**. How soon will the No. 2 battery be ready for the guns?

Col. **Wright**. We are expecting to complete both of those batteries within the next fiscal year. I should say, from the general idea that I get from the progress report, that the No. 2 battery should be ready for the guns by the end of the present calendar year.

Mr. **Borland**. Are you keeping within your estimates?

Col. **Wright**. That involves a certain amount of explanation with regard to this railroad. As to the construction of the batteries themselves we are keeping within our estimates. The total cost of the batteries, as appears from the latest estimate, will be $660,000 for four guns, which is in the neighborhood of $160,000 per gun. That, I think, compares favorably with the cost of similar work in the United States. But on the railroad we are exceeding our estimates by quite a little bit. The reason for that is, apparently, that the work on both the batteries and the railroad has been rushed and work was done during the rainy season of last year, which would not have been done at that time had we not been working under pressure. Increased cost has been incurred on that account. Of course, the additional cost of labor and materials has also entered into those matters.

Mr. **Borland**. How is that going to bring you out on the total? Is your railroad only available for batteries 1 and 2?

Col. **Wright.** The railroad was primarily constructed for use in connection with the building of the batteries, but it was so located as to form a valuable addition to the land defense system of the canal in that it provides for rapid communication from Fort Sherman to the defense lines in what we call the northwestern sector. The railroad will be of very considerable use by providing for rapid communication and for the transfer of supplies to troops that are holding those outlying defense lines, which I have previously pointed out to you. With that idea in mind the construction has been made in a more permanent manner than would have been the case had it been a purely construction railroad, to be taken out at the completion of battery construction work on the 12-inch batteries. That is also reflected in the increased cost.

SEA WALL.

Mr. **Borland.** The next item is a sea wall, which is a new item.

Gen. **Black.** That is a new item; yes.

Col. **Wright.** You are referring to the estimate of $63,000?

Mr. **Borland.** Yes; what is that item, General?

Gen. **Black.** There are two places, on the south side, where our permanent works are on fill and the fill in each case is exposed to wave action. One is Battery Parke on Naos Island near the end of the causeway.

Mr. **Borland.** Where did you say that was located?

Gen. **Black.** It is located on Naos Island. As I say, one point is Battery Parke, and the other is a part of the Fort Grant Reservation.

Mr. **Borland.** What is the composition of that fill?

Gen. **Black.** It is made of the material that came out of Culebra Cut. Some of it is a rock that disintegrates as soon as it gets out into the weather, while some of it is very hard volcanic rock.

Mr. **Borland.** How extensive will this sea wall be?

Gen. **Black.** There will be about 3,000 yards of riprap, which will cost some $6,000, less than $2 a yard, and there will also be 25,000 yards at just about $2 a yard. We will use this volcanic stone and will not use any of the stone which disintegrates.

Mr. **Borland.** You are going to use that volcanic rock?

Gen. **Black.** Yes, sir; either the volcanic or basaltic rock, but not the disintegrating rock.

Mr. **Borland.** You are going to use that igneous rock?

Gen. **Black.** Yes. We propose simply to put in riprap at around $2 a yard, which is pretty cheap.

Mr. **Borland.** What is the condition of your labor forces down there? Are you able to command labor for these jobs?

Gen. **Black.** We have been able to get the necessary force from the Panama Canal. Whenever we have that kind of work to do, we obtain labor and plant from them and pay them its cost.

Mr. **Borland.** That is the way you work it?

Gen. **Black.** Yes, sir.

Mr. **Borland.** How urgent do you think this is?

Gen. **Black.** I think it is quite urgent, because we may lose the battery if we do not stop the erosion, and we do not want to do that. I do not know how close it comes to the buildings on the Balboa Dump. Do you know, Col. Hase?

Col. **Hase.** No; but all of the troops live at the Balboa Dump, or, as we call it, Fort Amador. The military authorities there were in favor of calling all of that territory Fort Grant, but the descendants of Gen. Amador objected, so that they have gone back to calling it Fort Amador. The buildings are right on the Balboa Dump, or Fort Amador, and no doubt the wave action has an eroding effect on the fill near those buildings and will, in time, undermine them unless repaired.

Gen. **Black.** The principal work that is liable to be destroyed on that Fort Grant reservation is one of the expensive roads that is now being undermined.

Mr. **Borland.** This is not a sea wall, but is raprap work.

Gen. **Black.** It will be riprap protection.

Mr. **Borland.** What have you to say about that being sufficient for the purpose?

Gen. **Black.** Oh, it will be sufficient, without doubt. We use a sea wall or riprap, according to the circumstances. The wave action that we have there does not seem to pull out the stones or carry them away, but simply carries away that which can be easily washed out.

PURCHASE AND INSTALLATION OF SEARCHLIGHTS.

Mr. **Borland.** The next item is "For the purchase and installation of searchlights for the seacoast fortifications on the Canal Zone." In 1918 you had a deficiency appropriation of $78,774. What was done with that money?

Col. **Wright.** The deficiency item of $78,774 was submitted for the purpose of providing four new searchlights and generating equipment for them, to be installed in addition to the 13 light projects which had previously been adopted. Of that amount we have an unallotted balance of $23,764 and an allotted balance of $7,348.30. I have already stated the basis of that appropriation.

Mr. **Borland.** The estimate this year is for $23,400.

Col. **Wright.** Yes. The regular estimate submitted for this year is $23,400. That was submitted for the purpose of altering the thirteen 60-inch searchlights, which we now have on the Canal Zone, so that they can use the new high-intensity Sperry mechanism. That was at an estimated cost of $1,800 per light. In addition to the regular estimate we have submitted a supplemental estimate—it has perhaps not reached the committee—in the sum of $135,000. This estimate of $135,000 is expected to complete the searchlight installations on the Zone, which include under the present project of the War Department seventeen 60-inch searchlights and one 36-inch portable light.

Mr. **Borland.** You say that the $78,774 allowed in the deficiency act of 1918 was to complete the system of 13 lights?

Col. **Wright.** No, sir; the $78,774 was to purchase the equipment for four additional lights.

Mr. **Borland.** Making 17 in all?

Col. **Wright.** Yes, sir. We are now working on the basis of a 17-light project.

Mr. **Borland.** You were not able to purchase that equipment?

Col. WRIGHT. The allotment has been made for that equipment. Whether we can definitely secure the equipment in the near future depends, as was brought out in previous hearings, on the demands from abroad.

Mr. GOOD. You now have 13 sets already installed and 4 more ordered?

Col. WRIGHT. Thirteen are on the Isthmus; yes, sir: and four under order.

Mr. GOOD. Then I do not quite understand what this supplemental estimate of $135,000 is for.

Col. WRIGHT. That $135,000 is to complete the installation of the 17 lights.

Mr. BORLAND. That is not an additional 17, but that is the 17?

Col. WRIGHT. Yes, sir; the 17 lights.

Mr. BORLAND. To complete the installation of them?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. This $23,400 is to change the original 13 lights to the Sperry high-intensity lights?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. Then you expect to add four more lights?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. Which you have ordered but have not been able to get on account of the demands from abroad?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. That will make 17 in all?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. This $135,000 is for the emplacement of those 17 lights?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. Have you not now the emplacements for the original 13?

Col. WRIGHT. Some of the original 13 are placed in their final positions, while others of the 13 are not. There has been a certain amount of adjustment of those lights. Some of them have been removed from their permanent positions and placed in other locations in order to take care of temporary emergencies. General considerations of fire control and communication have also led to increases in the estimates. I should like to place in the record the detailed changes which we propose to make in the installation of each of these 17 lights in order that the committee may see exactly where this $135,000 is to go. (See p. 483.)

Mr. BORLAND. By virtue of whose order was that change made?

Col. WRIGHT. The project, which met the views of the local authorities, the Chief of Coast Artillery and the Chief of Engineers, came up from the Isthmus about the 25th of March of the present year. That project was definitely approved for 17 lights about one month ago and is the basis upon which we are now doing our searchlight work.

Mr. BORLAND. What is the nature of the emplacements that you put in for those 17 lights?

Col. WRIGHT. Very nearly all kinds of installations are included in the 17. Some of them are on small cars which are kept under shelter during the daytime and pushed out at night by hand to their operating positions. Two lights are on elevating towers, which are lowered when the light is not operating and can be raised to give it a very considerable elevation over the surrounding territory. Those two lights are at locations where the site is almost at sea level. One of the lights is on a railroad car, on which the generating set, the controlling mechanism and everything pertaining to the light are carried along with the projector, and move with it. One of the lights is mounted on a barge which is moved around the harbor of Colon and occupies two or three positions in the harbor. In fact, the Panama Canal project includes almost all types of searchlight mounting thus far used.

Mr. BORLAND. I think you had better give the committee a detailed list of those emplacements.

Col. WRIGHT. Very well, sir.

Details of estimate for installation of searchlights at the Panama Canal.

Designations of light.	Details of present estimate.		Total estimate to be submitted.
Pacific 1	Telephone cable	$500.00	
	Cable installation	250.00	
	Return of light from Culebra Island to Perico Island	300.00	
	Telephone installation	100.00	
	Total	1,150.00	
	Contingencies	300.00	
	Total estimate		$1,450
Pacific 2			
Pacific 3			
Pacific 4			
Pacific 5	Telephone to C1	100.00	
	Return of light from Colon and repairs to installation	800.00	
	Total	900.00	
	Contingencies	225.00	
	Total estimate		1,125
Pacific 6	Telephone cable	500.00	
	Telephones	100.00	
	Installation of cable	250.00	
	Total	850.00	
	Contingencies	210.00	
	Total estimate		1,060
Pacific 7	Projector	6,500.00	
	Generating set	6,000.00	
	Cable	2,425.00	
	Installation	21,800.00	
	Total	36,725.00	
	Contingencies	9,775.00	
	Total estimate		46,500
Pacific 8	Projector	6,500.00	
	Generating set	6,000.00	
	Cable	1,970.00	
	Installation	13,700.00	
	Telephone cable	6,000.00	
	Installation telephone cable	1,000.00	
	Total	35.170.00	
	Contingencies	9,380.00	
	Total estimate		44,550
Atlantic 1	Telephone to F1	$100.00	100
Atlantic 2	Cable	692.50	
	Installation light, cable, and telephones	2,350.00	
	Total	3,042.50	
	Contingencies	857.50	
	Total estimate		3,900
Atlantic 3	Telephones to F1 and F2	100.00	100

Details of estimate for installation of searchlights at the Panama Canal—Continued

Designations of light.	Details of present estimate.		Total estimate to be submitted
Atlantic 4	Control cable	$3,250.00	
	Installation of cable	300.00	
	Installation of telephones	100.00	
	Total	3,650.00	
	Contingencies	900.00	
	Total estimate		$4,55
Atlantic 5	Projector	6,500.00	
	Generating set	6,000.00	
	Cable	405.00	
	Installation	10,850.00	
	Total	23,755.00	
	Contingencies	6,245.00	
	Total estimate		30,000
Atlantic 6	Cable	525.00	
	Cost at knock-down barge at Balboa	7,973.84	
	Erection at Balboa shops	6,500.00	
	Construction of superstructure	2,526.16	
	Installation of tower, light, and plant	3,500.00	
	3 sets concrete anchor blocks	3,000.00	
	11,000 feet of cable on west breakwater	5,500.00	
	1,000 linear feet 2-pair cablet	500.00	
	Installation of cable	1,200.00	
	3 telephone installations	150.00	
	3 terminal huts	300.00	
	Total	31,675.00	
	Contingencies	8,000.00	
	Total estimate		39,675
Atlantic 7	Projector	6,500.00	
	Generating set	6,000.00	
	Cable	1,000.00	
	4 telephones	200.00	
	Telephone cable	750.00	
	Preparation of site	500.00	
	Excavation	750.00	
	Push-car installation	2,500.00	
	Shelter for light	750.00	
	Power house	1,000.00	
	Installation	2,000.00	
	Total	21,950.00	
	Contingencies	8,050.00	
	Total estimate	30,000.00	30,000.0
Atlantic 8	Telephone to F1-3	100.00	100.0
Atlantic 9	Cable	965.00	
	Installation	5,575.00	
	Total	6,540.00	
	Contingencies	1,760.00	
	Total estimate	8,300.00	8,300.0
			211,410.00
	Appropriated in deficiency act of June 15, 1917		78,000.00
	Net estimate		133,410.0
	Or in round numbers		135,000.0

Mr. BORLAND. Your ability to get these searchlights has been explained in other hearings. Now, what have you to say about your ability to make the installations in case you get the lights?

Col. WRIGHT. There is no question at all about making the installations. In case the appropriation is made we expect to commence work on the isthmus at once and to push it to completion promptly, so that the mounts will be prepared for the lights just as soon as Gen. Pershing's demands permit the lights to become available.

Mr. GOOD. Does the completed program at Panama call for 17 searchlights?

Col. WRIGHT. The project which the War Department has in prospect at present contemplates three additional lights, but the locations chosen for those lights place them beyond the protection of the armament now emplaced. They could therefore be readily taken, and we do not consider it advisable to install those lights unless we can emplace additional armament to defend them.

Mr. GOOD. How important is it to make appropriations for these searchlights now, inasmuch as the heavy armament has not been even ordered?

Col. WRIGHT. We are not asking for appropriations for heavy armament outside of the 12-inch long-range guns.

Gen. BLACK. You do not understand the question. You are alluding to the fact that we are putting in no 16-inch guns, but we have 12-inch and 14-inch guns, and that is pretty heavy armament. We thought a few years ago it was as heavy as we could get.

Col. WRIGHT. The lights which we are asking are entirely for the use of the armament which is already emplaced on the Canal Zone, and is prepared for use at any time.

Mr. BORLAND. Will you need any additional lights if you get your 16-inch guns there?

Col. WRIGHT. The three lights in prospect, while they will assist the fire of the present armament, would also assist very greatly the fire of the projected 16-inch armament. As to whether lights in addition to that will be necessary, I am not prepared to state.

Gen. BLACK. I hope, eventually, we will be able to reduce very materially the number of searchlights needed for all our coast defenses.

Mr. BORLAND. You speak of changing the 13 lights now there into the Sperry system. Are you able to do that pretty promptly?

Col. WRIGHT. I think we will be able to do that promptly; yes sir. The statements which I made at the previous hearing as to changing over these lights were a bit pessimistic. It developed on further investigation that the Sperry Co. was turning out lamp mechanisms at a more rapid rate than we were able to secure new projectors in which to place the mechanisms. Up to January, 1918, we were thus able to secure 50 Sperry lamps for use in changing over seacoast projectors to use the high intensity lights; and had at that time placed an order for 75 additional lamp mechanisms with the idea of changing over the remainder of them. The prospects were that we could secure those lamps without at all retarding the shipment of completed projectors to France. I inserted that data in a note to the hearings when I revised them.

LAND DEFENSES—ARMORED MOTOR CARS, SEARCHLIGHTS, ETC.

Mr. BORLAND. "For land defenses, Panama Canal, including the procurement and installation of searchlights, purchase of armored cars and locomotives."

You had last year $29,500 in the deficiency act.

Gen. BLACK. Yes, sir; as against an estimate of $780,000.

Mr. BORLAND. What is covered by these land defenses?

Col. WRIGHT. The regular estimate for this year is in the sum of $355,000. The basis of the estimate is $170,000 for the purchase of ten 36-inch portable searchlight outfits and possibly certain smaller lights; also a total of $135,000 for land-defense structures, which is itemized under $50,000 for barbed-wire entanglements, $79,000 for trenches, gun positions, shelters, etc., and $6,000 for the construction of a parados for the switchboard room at Flamenco Island. The remaining $50,000 is intended for the construction of armored cars and locomotives. All of these items were submitted to the committee in the estimate of last year.

Mr. BORLAND. Of course, you have no reasonable prospect of getting these armored cars and locomotives?

Gen. BLACK. I would not say that, sir, because we have heretofore been able to get what we pleased in that respect. For instance, take the armored car. We have now, I think, under construction, although we have not been pressing it at all, an armored car which is self-propelling. We can take those self-propelled passenger cars in use on the western roads, put the armor over them and transform them at once into an armored car such as we want.

Mr. BORLAND. Have you any armored cars and locomotives in Panama?

Gen. BLACK. No, sir; none whatever.

Mr. BORLAND. None has ever been provided?

Gen. BLACK. None for Panama; no, sir.

Mr. BORLAND. What is the purpose of these armored cars and locomotives?

Col. WRIGHT. The armored cars and locomotives are intended for the transfer across the Naos Island causeway of the troops who are to man Fort Grant. As has been previously brought out, the quarters of these troops are on the Balboa dump, and the armored cars and locomotives will serve to transfer them across the causeway. It is also expected they may possibly be used on the Panama Railroad and such branches as may built for land defense purposes.

Mr. BORLAND. How many troops are transported across to Naos?

Col. HASE. There about 1,800 men at Fort Grant. That is, they live at Fort Amador and go to their batteries at Fort Grant each day for drills.

Mr. BORLAND. Does it take 1,800 men to man those batteries.

Col. HASE. Yes, sir.

Mr. BORLAND. You formerly had in this item "Construction of roads and surveys incidental thereto." I suppose that was included in your former estimate.

Col. WRIGHT. That was included in the former estimate, but it is being submitted this year as a separate item.

Mr. BORLAND. What did you do with the $29,500 which was appropriated?

Col. WRIGHT. The $29,500 was secured for the purpose of improving the Cano William Canal, for the construction of gun sheds and storage sheds at Fort Randolph and at Fort Amador, and for placing a concrete floor in a storehouse already existing at Fort Sherman. Ten thousand dollars has been allotted for improving the canal and $19,500 for the construction of the sheds and the floor.

Mr. BORLAND. How have you progressed with that work?

Col. WRIGHT. At the Cano William Canal the total work done has consisted in clearing 2.2 acres and in excavating nearly 10,000 cubic yards from the canal. Of the gun sheds, that at Fort Amador is completed with the exception of placing the doors. As to the Fort Randolph gun shed, all details have been worked out and the construction has recently been commenced.

Mr. BORLAND. Does your allotment cover all the work you expect to do in improving that canal?

Col. WRIGHT. Yes, sir.

Mr. BORLAND. What is the purpose of the canal?

Col. WRIGHT. The canal provides means of access from Fort Randolph to the searchlight positions and fire-control stations at Galeta and Largo Remo. The necessity for water communication to these stations arises from the fact that the ground in the neighborhood is very low and swampy, and is thickly overgrown with jungle. Access by land is extremely difficult. For this reason it was desired to make the Cano William Canal navigable for comparatively small boats in order to secure water access to the stations. This was the basis of the appropriation which was made last year.

Mr. BORLAND. What is the $1,600 for which you are asking in the supplemental estimate?

Gen. BLACK. We will have to look that up.

CONSTRUCTION OF ROADS AND RAILROADS IN VICINITY OF CANAL ZONE.

Due to the increased cost of material and labor, $19,500, which was intended for the construction of the sheds at Fort Randolph and Fort Amador, and for the construction of the concrete floor in the storehouse at Fort Sherman, will not suffice to complete the last item. The deficiency estimate of $1,600 was submitted for the purpose of providing funds for the completion of the concrete floor in the Fort Sherman storehouse.

Mr. BORLAND. You are asking for a new item, "For the construction of roads and railroads for military purposes in and in the vicinity of the Panama Canal Zone, including the cost of surveys therefor, $2,000,000." That embraces both railroads and wagon roads.

Col. WRIGHT. That is the language of the estimate. From the information we have from the Canal Zone, the construction contemplated is entirely wagon roads.

PURCHASE AND INSTALLATION ELECTRIC LIGHT AND POWER PLANTS AT SEACOAST FORTIFICATIONS IN PANAMA.

Mr. BORLAND. You formerly had an item in the bill "For the purchase and installation of electric light and power plants for the seacoast fortifications on the Canal Zone, $55,000."

Col. WRIGHT. Yes, sir.

Mr. BORLAND. That item seems to have been stricken out.

Col. WRIGHT. That $55,000 was secured in the deficiency act of June 15, 1917, for the purpose of building a transmission line to connect the fortifications at Fort Grant with the distribution system of the Canal Zone. This would enable the Fort Grant fortifications to secure their power from the main generating stations at Gatun and Miraflores, and would give them that source of power in addition to their 25-kilowatt sets. That appropriation is practically all either allotted or pledged. The greater part of the appropriation, over $50,000, is to be used for the actual purchase of the cable which is necessary for the transmission lines. The order for this cable has been placed. A portion of the remainder of the appropriation has been used in preparing for the installation of the cable, and the remainder of it will be used for the actual installation as soon as the cable is delivered by the manufactures.

Mr. BORLAND. What will that provide? How much power will that provide?

Col. WRIGHT. It is intended to connect the fortifications at Fort Grant with the Canal Zone distributing system.

Mr. BORLAND. Fort Grant is the fort on Naos Island?

Col. WRIGHT. Yes, sir. It will enable us to secure power at Fort Grant from the Panama Canal stations at Gatun and Miraflores, and will in that way supplement the 25-kilowatt sets in the batteries themselves.

Mr. BORLAND. Why do you not have your independent plant at Fort Grant?

Col. WRIGHT. We have an independent plant at Fort Grant in the batteries. The 25-kilowatt sets are there, but this line is for the purpose of securing an additional source of power.

Gen. BLACK. That has been appropriated for.

Mr. BORLAND. What is the advantage in doing that? Is it cheaper to get power from Panama?

Col. WRIGHT. Yes, sir; it will be very much cheaper.

Mr. BORLAND. What is this $17,000 for that you are now asking?

Col. WRIGHT. The $17,000 is for the purpose of providing and installing two 25-kilowatt generating sets in the new Chagres batteries—the two 12-inch long range batteries which are at present under construction. We expect to place one 25-kilowatt set in each battery and to unite them with a tie line, so that both batteries can be lighted from either set.

Mr. BORLAND. How complete is your power installation now.

Gen. BLACK. All of the batteries that have been constructed have the power installation. This is a part of the construction of those two new batteries—a necessary part of the equipment.

Mr. BORLAND. What is your prospect of being able to get these sets?

Gen. BLACK. We are purchasing them right along.

Col. WRIGHT. The prospects are very good, sir. We can not secure any of those sets until probably the first of November, but after that date we will in all probabability be able to secure all that we have any need for.

Mr. BORLAND. What are you doing for light there now?

Col. WRIGHT. There is little need for light at present because the batteries are not built, and whatever light is needed is furnished from a temporary installation.

Mr. BORLAND. When will the batteries be in commission?

Col. WRIGHT. We are hoping to complete them during the next fiscal year.

Mr. BORLAND. You will not need your lights until they are completed?

Col. WRIGHT. If we can get one of these sets to him, the district engineer wishes to employ it for lighting purposes during the construction of the batteries, and he would like to have them both. I presume, if it is possible. When I say that the batteries will be completed by July 1, 1919, I want to be understood as meaning that the batteries will be complete in all respects, everything being ready to turn over to the Coast Artillery. I do not mean to say that only the concrete work will be completed.

SUPPLY WHARF AT FORT DE LESSEPS, PANAMA.

Mr. BORLAND. You also have an item for a supply wharf at Fort De Lesseps.

Col. WRIGHT. We were directed by the Adjutant General to submit an estimate for the construction of a supply wharf at Fort De Lesseps, which is in Colon Harbor. This wharf will replace an existing timber wharf which is decaying and which is situated at considerable distance from the coast defense headquarters now located at Fort De Lesseps. The new wharf will be constructed nearer coast-defense headquarters and also nearer the existing storehouses and warehouses and will be used in connection with the movement of troops and supplies at the Atlantic entrance to the canal.

Mr. BORLAND. What is to be the character of the wharf?

Col. WRIGHT. Presumably a concrete wharf.

Mr. BORLAND. And you say there is a wooden wharf there now which is inadequate?

Col. WRIGHT. Yes, sir; it is decaying and is not conveniently located.

Mr. BORLAND. Do you expect to do this work this year?

Col. WRIGHT. Yes, sir; if the money can be secured, we can unundoubtedly do it. It is a comparatively small matter.

SATURDAY, JUNE 1, 1918.

STATEMENTS OF COL. W. F. HASE, LIEUT. COL. C. E. BRIGHAM, GEN. C. McK. SALTZMAN, COL. R. C. MARSHALL, COL. HERBERT WHITE, AND LIEUT. COL. J. Q. A. BRETT.

FIRE-CONTROL INSTALLATIONS.

Mr. BORLAND. In Document No. 959 there is a supplemental estimate "For the construction of fire-control stations and the purchase and installation of accessories therefor, $345,888.85." What is the explanation of that item?

Col. HASE. All of the items included in this estimate were recommended by the fire-control board at Panama and were subsequently approved by the War Department Board of Review. The separate items which enter into the sum total are as follows:

1. Extensions to post telephone systems at Forts Grant, Sherman, Randolph, and De Lesseps, $36,559. This item covers the extensions required to connect the existing post telephone systems with the barracks, quarters, and the batteries, which have been recently added to the defense of Cristobal and Balboa.

2. To convert base end stations into auxiliary battery-commander stations, $35,977.87. The stations to be converted are stations for Bat-

teries Howard and Baird, the stations being at X, the same batteries which have stations at X^{I}; batteries Prince and Carr, with stations at X^{II}, and batteries Merritt and Prince with stations at X^{III}. A part of the water areas covered by these base end stations can not be seen from the regular firing stations, and therefore it is necessary to convert the base end data stations into auxiliary firing stations in order that the armament may be used to cover all of those water areas which can not be seen from the regular firing stations.

3. To provide telephonic communication and distance control between the fire commander's stations, watchers' booths, and searchlights, $29,150; three searchlights on the Atlantic side and four on the Pacific side. I might add that the lights which were sent to Panama were emplaced experimentally. It has now been definitely determined by the fire-control board where the maximum effective illumination can be procured from those lights, so that the permanent stations for the lights have been arrived at, and this item provides the telephonic communication between the fire commander's and the light positions.

4. Fire-control cable to Z Island, $139,000. This item provides for the purchase and installation of a 50-pair cable between Fort Grant and Z Island. This cable will provide communication from Fort Grant to the fire-control stations which are to be installed on the island in connection with existing defenses and will also serve additional defensive elements projected on the island under the present project of the War Department. In other words, we propose to put in a 50-pair cable at this time rather than to put in a 10-pair cable, because the relative cost of the 50-pair cable is not five times that of the 10-pair cable. We are looking ahead to the future.

5. Construction of three fire-control stations on Z Island, including the purchase of the necessary sites, engineering work, etc., $10,800; 15 acres of land, $3,000; and surveys, etc., $816, making a total of $14,616. The stations to be provided are for Batteries Merritt, Prince, and Carr.

The project contemplates the installation of D. P. F. instruments in these stations. Included in this is an item of $3,000 for the 15 acres which will be required for the installation of these stations. If favorable consideration should be given to the item which was before the committee yesterday, the $3,000 can be eliminated from this particular item.

Mr. Borland. What is the explanation of these estimates, which appear to be in completion of the original plans of the Board of Review for the fortifications of Panama? What is the explanation for their coming in as supplemental estimates?

Col. Hase. The projects under paragraphs 1, 4, 5, 6, and 7 have been before the War Department for some time; that is, they came in in 1915 and 1916, and originally they included a greater number of extensions to the regular system than are here proposed. They were sent back several times in order that certain discrepancies might be eradicated and that the fire-control board might eliminate some things which they had asked for and which they thought were necessary, but which the office of the Chief of Coast Artillery did not believe necessary.

Mr. Good. Then they have not regarded their acquisition as very important, because it would seem they have been quibbling for two or three years over the details, so that it would seem they did not regard them as very essential.

Col. Hase. The difficulty with them, Mr. Good, was that they were so involved with other questions that pertained not only to the fire-control installation but also to the quartermaster construction and the engineer construction.

Mr. Good. But even so, why should it take from 1915 to 1918 to harmonize those little differences, if it is an important matter?

Col. Hase. A change of Coast Artillery commanders and a change of department commanders caused delay. Then the Panama Canal Department was established and separated from the eastern department. When the 1919 estimates were under consideration last summer a letter was addressed to the Chief of Engineers, requesting that items 1, 4, 5, 6, and 7 be included in the Panama estimates for 1919. Through a misunderstanding they were not submitted, and hence are included in these supplementary estimates. Nineteen of the 21 additional stations have already been constructed and these supplemental estimates include the fire-control installation required to complete the extended system. The work has been going on and the actual construction of the 19 stations has been completed

Mr. Borland. Not in all cases?

Col. Hase. Not on the three stations on Z.

Mr. Borland. The work has not been completed on Z?

Col. Hase. Not on Z; no, sir. I was thinking about these auxiliary firing stations and supplemental stations at X, X^{I}, X^{II}, and X^{III}.

Mr. Good. Why did you not estimate for the money to complete the installation of those stations that have already been established?

Col. Hase. Those are auxiliary stations which had been established and built out of funds which had been appropriated for fire control before 1916.

Mr. Good. But the telephonic communication has never been established?

Col. Hase. These are new telephones which will have to go in in order that the battery commander in these auxiliary firing stations can be connected up with the plotting room. You can not use the present data transmission lines to get information to the battery commander in order that he may get his instruments set on the firing data.

Mr. Good. How do you run your lines—underground?

Col. Hase. Yes, sir. They are all subterranean. I had not finished all the items.

6. Two ¼-kilowatt radio sets and stations, one for each end of the canal, for use during target practice and to receive early information from scout vessels, similar to the sets which have been established in all home-defense commands, $7,000.

7. Then the completion of the extension to the original fire-control project at the Atlantic entrance, $42,000; at the Pacific entrance, $7,600; contingencies, $7,200, and the Signal Corps material to provide for these extensions, $26,975.98, or a total of $83,775.98. The sum total of this estimate is $345,888.85.

Mr. Borland. How much of that will be spent for labor on the canal and how much for material that must be shipped from the United States, approximately?

Col. Hase. I imagine that two-thirds would be done on the canal and one-third would be required to be shipped from the States.

Mr. **Borland**. How long will it take to do the work?

Col. **Hase**. A great amount of the work under items 1, 4, 5, 6, and 7 has already been completed, and I believe that they could certainly complete it before the end of the fiscal year 1919.

Mr. **Borland**. You think they could?

Col. **Hase**. I believe they could; yes, sir.

Mr. **Borland**. This is a matter which has been under consideration in a rather deliberate way for three years?

Col. **Hase**. Yes, sir; because of the fact that there have been quite a number of changes in the fire-control board at Panama, which consists of the Coast Artillery district commander, the two coast-defense commanders, their staff officers, and the district engineer. Their proceedings are sent to the department commander and then come to us from the War Department.

Mr. **Borland**. We are now at a point where material and labor are at the very peak, and when the demands on the resources of the country in regard to manufacturing and transportation are greater than can possibly be met.

Col. **Hase**. But these items are Signal Corps material such as wire, telephones, cable, bells, push buttons, small hand-set switches, and items of that kind. I do not believe the Signal Corps would encounter much difficulty in procuring them.

Mr. **Good**. I observe that in the letter of the Secretary of War under date of February 23 last, to the Secretary of the Treasury, he says:

> This item was not included in the regular estimates for the fiscal year 1919, for the reason that the necessity for this appropriation was not apparent at the time the estimates were prepared and submitted.

According to your statement the necessity was apparent, but the details had not been worked out.

Col. **Hase**. The necessity, I believe, has been apparent for some time, but it was just a question of trying to get the authorities at Panama to appreciate the fact that we did not want to extend the fire-control system to all of the outlying points. Their proposed system was very much more elaborate than anything included in these estimates. As stated above, it was contemplated that a majority of the items was to be included in the regular 1919 estimates.

Mr. **Good**. You have a provisional system of fire control at every battery you have installed at Panama, have you not?

Col. **Hase**. We have even more than that, Mr. Good; we have a standard system.

Mr. **Good**. The standard system is where the cables——

Col. **Hase** (interposing). Are laid underground, and everything complete, you might say.

Mr. **Good**. That has been installed recently.

Col. **Hase**. Oh, yes, sir; but this is in the nature of an extension in order to permit the batteries to cover all of the water area in their fields of fire; at the present time we have base lines that do not cover the entire field in front of the batteries. These extensions contemplate auxiliary systems that permit a view of the entire field of fire, which will make possible the delivery of fire on all of the water area in front of the batteries.

Col. **Hase**. Itemizing Item No. 7—(*a*) at Fort Sherman: **Alterations and additions to equipment in the fire-control switchboard room.**

and the post telephone switch room; slight alterations and additional equipment in C1, F1, F2, to provide for searchlight control; installation of all fire-control equipment in M1 and M2; the auxiliaries at Howard and Baird; the laying of cable from M3 to the plotting room of Kilpatrick; laying of cable from splice No. 24 to Howard auxiliary; running of cable from splice No. 17 to Baird auxiliary; laying of a 50-pair cable from the switchboard room to the auxiliaries of Howard and Baird, and to convert B 2nd Howard and B 2nd Baird into B C station.

(*b*) At Fort Randolph: Alterations and additions to equipment in the fire-control switchboard room and the post telephone switchboard room; slight alterations and additional equipment for C2; B. C. Webb; F3, to provide for searchlight control. The installation of all fire-control equipment in the auxiliaries for Webb, Tidball, and Zalinski; to install 50-pair cable from the switchboard room to the 100-foot hill and to install a 20-pair cable from the 100-foot hill to M.

(*c*) At Fort De Lesseps: Slight alterations in the switchboard room.

(*d*) On the Pacific side, at Fort Grant: Alterations and additions to the equipment in the fire-control switchboard room; the installation of the remainder of the fire-control equipment in F3; in the B C of Merritt and Carr; the B4 Merritt, B4 Carr, B3 Prince, B4 Prince, B2 Burnside; additions and alterations in the plotting room of Warren No. 1 and No. 2; to provide for searchlight control and the laying of a 10-pair cable from One Point to Two Point.

Mr. BORLAND. Colonel, it does seem to me that if there was anything very urgent and imperative and dangerous about your situation down there, there would have been a little more progress made in the department in getting their estimates together and getting them in final shape and sending them in here. It seems rather strange that they come in here as a supplemental estimate at this late hour, after a rather leisurely course of three years through the department, especially in view of the fact that we are overwhelmed with a great many other things that are absolutely vital and that we can not escape. If you had any items down there that seemed to be reasonably within reach to improve the use of the guns in any sudden attack that may be made on them in this war, that would be a different proposition, but I can only see a few of these items that would even tend in that direction.

Col. HASE. With the papers going to the Board of Review and going back and forth to the Fire Control Board at Panama, and trying to get the reports modified to conform with what was thought the best fire-control installation, there has been delay.

Mr. BORLAND. Well, that is a question that will never be determined. You will never live to see that question determined.

Col. HASE. Most of the construction work has been completed and the necessary ordnance equipment has been supplied. All that is necessary to make the system complete is the procural and installation of the communication accessories. This installation is considered most important, and if not appropriated for this year will have to come before the committee again. It is pointed out that the major portion of the work has already been done, and unless these accessories are supplied now that part of the work consummated would be of no avail. In our work there must be progression. We progress from one thing to another and certain improvements are added. For instance, in connection with the long-range 12-inch batteries that are going in, we may have to supplement our fire-control system by an entirely different system of observation.

Mr. **Good**. Why?

Col. **Hase**. On account of the curvature of the earth. They have a range of about 30,000 yards, and we believe we have got to go to balloon observation.

Mr. **Good**. The 16-inch guns we are putting in will have a greater range than that, will they not?

Col. **Hase**. Exactly; but as to those that we are contemplating for the western side of the canal we fortunately have the great height of Z.

SUBMARINE MINES.

Mr. **Borland**. "For purchase of submarine mines and nets and the necessary appliances for operating them for closing the channels leading to the Panama Canal."

In the last bill you had $250,000, and there is no estimate in this bill?

Col. **Hase**. No, sir.

Mr. **Borland**. Can you advise the committee as to the work done under this appropriation of $250,000?

Col. **Hase**. This appropriation of $250,000 was for the purpose of the procurement of nets for the protection of the termini of the Panama Canal, and for the purchase of material to complete the projects and to procure a certain amount of reserve material. Of the $250,000 carried in the bill there was unobligated on April 6. $136,748. Difficulty has been encountered in placing orders for some of the material. About 13 per cent of the cable required to complete the project at Panama is still to be purchased.

Mr. **Good**. What do you mean by completing the project at Panama; the entire project of laying submarine mines?

Col. **Hase**. Yes, sir. This unobligated money will complete the submarine mine defense project at both ends of the canal.

Mr. **Borland**. What is the prospect about being able to get that material within the next fiscal year to use the unobligated sum.

Col. **Hase**. The disbursing officer has purchased about one-half of the amount covered by the appropriation, and I believe, therefore. he will be able to procure all the material in the next year. Col. Brigham states that he has stated he would be able to do that.

Mr. **Borland**. Colonel, how about your submarine base at Coco Solo Point?

Col. **Hase**. Mr. Borland, we have very little information about that. We have a progress report on it, and that is all.

Mr. **Borland**. Is there anybody here who knows about that?

Col. **Hase**. No, sir; Capt. McKean, of the Navy, last year testified on that. It is really a naval item, and I think your clerk tried to get Capt, McKean by phone. It appears in the 1918 hearings on page 111. He also covered the next item.

SUBMARINE BASE AT COCO SOLO POINT.

(See p. 531.)

Mr. **Borland**. You got $902,625 for the submarine base at Coco Solo Point in the deficiency act of October 6, 1917?

Col. **Hase**. Yes, sir; that is under the Navy Department.

Mr. **Borland**. I venture to say a good deal of that appropriation is unallotted.

Col. **Hase**. In the progress report which we have received from Panama there is no mention of funds. It just speaks in percentages of completion of work. The percentages run from about 50 per cent up to 97 per cent, so I rather believe thay have made considerable progress there in the construction work.

CONSTRUCTION AND DEVELOPMENT OF AERONAUTIC STATION.

(See pp. 499, 531.)

Mr. **Borland**. "For the construction and development of an aeronautic station on the Canal Zone, $250,000." Have you this item?

Col. **Hase**. No, sir; Capt, McKean also testified in reference to that item last year.

ALTERATION AND REPAIR OF SUBMARINE MINE MATÉRIEL.

Mr. **Borland**. "For alteration, maintenance, and repair of submarine mine matériel."

You had $2,500 in the regular bill in 1918 and a deficiency of $47,500. What is the state of that appropriation?

Col. **Hase**. The deficiency act carried $47,500, which was estimated as being necessary for purchasing the new net material for maintaining the nets at the Panama Canal; that is, the submarine nets. No expenditures have been made and no obligations have been incurred under that appropriation because of the fact that the canal authorities improvised nets out of old material salvaged from the Panama Canal construction operations. These nets are now in position, and it is contemplated that when they are pronounced ineffective new nets will be purchased and sent down.

Mr. **Borland**. Let me see if I understand that clearly. You have not spent this $50,000?

Col. **Hase**. We have not spent a cent of the $47,500 appropriation.

Mr. **Borland**. The appropriation of $2,500 is your regular maintenance item?

Col. **Hase**. Yes, sir; that is the regular maintenance item for submarine mine material at Panama, and we had an unobligated balance on April 6 of $2,907.79, $407 being carried over from the past year.

Mr. **Borland**. Why are you estimating $10,000 for that item when you have a balance carried over from the previous year?

Col. **Hase**. For this reason: The increase in the estimate over previous years is due to the increase in cost of material. and also to the change in the policy with reference to the purchase of cable. Heretofore it has been the practice to purchase cable only in large lots at frequent and irregular intervals to replace cable which is actually defective, with the resulting probability that all of the cable which was purchased at any one time would become worthless at about the same time. It is believed this is not a sound policy and that the efficiency of the submarine mine projects will be increased by purchasing and supplying submarine material in small annual increments. This is the same policy which we had up with reference to the cable for the insular possessions, and it has been recommended by the Bureau of Standards, with whom we consulted.

Mr. BORLAND. Colonel, I have never understood clearly this cable policy which you tried to explain at that time. Do I understand you waited a number of years and then got a large appropriation to buy cable?

Col. HASE. No, sir.

Mr. BORLAND. And that this plan contemplates distributing that large purchase over a number of successive years. If that is not the case, on the face of it it appears to me to be a very decided increase in cost.

Col. HASE. In the Philippines, when we established our mine system there, we did procure enough appropriation to purchase the required amount of cable. At Panama we did the same thing. We have, for instance, 28 miles of 19-conductor and 38 miles of single-conductor cable there, and it is proposed, estimating the cost of 19-conductor cable at $3,500 and the single-conductor at $750 per mile, to ask for an annual replacement of 5 per cent, or a money figure of $6,325. We assume the life of the cable at 20 years; because of that fact, we are asking for 5 per cent annual replacement.

Mr. BORLAND. Assuming the committee gave you the $10,000, would you invest that in cable and then run along for 5 or 10 years without asking any more money on that account?

Col. HASE. No, sir; it is proposed to come to the committee and ask for 5 per cent annual replacement, or $6,325 per year.

Mr. BORLAND. Five per cent of what?

Col. HASE. Five per cent of the total cost of the cable which is necessary for the projects at Panama.

Mr. BORLAND. What is the $10,000?

Col. HASE. That is this 5 per cent annual replacement plus the annual maintenance of $2,500, which is increased by 50 per cent on account of the increased cost of material.

Mr. BYRNS. You did not use all of that $2,500, as I understand it?

Col. HASE. No; because of the fact that our mine instruction at Panama had been delayed somewhat by reason of the fact that our new combined mine planter and cable ship went down to Panama last December. She is now stationed there and that is to be her permanent station.

Mr. BYRNS. I notice, Colonel, even in 1917 you expended only $1,274.94 out of the $2,500 which was appropriated, and then you had a $400 balance, or is that the year that you mentioned having a $400 balance?

Col. HASE. The unobligated balance on April 6 was $2,907; we got $2,500 in the 1918 bill, so that we brought forward $407.

Mr. BYRNS. The figures submitted to the committee as the expenditures for 1917 show an expenditure of $1,274.94 out of the $2,500.

Col. HASE. That was for the fiscal year 1917.

Mr. BYRNS. So you have not been expending anything like the $2,500 during the years preceding?

Col. **Hase.** That is the way it would appear from these figures.

Mr. **Borland.** Yes; and it would also appear, Colonel, that these increases are all along the line and not solely in the cable. For instance, for stationery, office and drafting supplies, you spent $186 in 1917, and this estimate is $1,305. Electrical supplies—I do not know whether that includes cable or not.

Col. **Hase.** No, sir; the cable is an item of $6,325.

Mr. **Borland.** Where is that? That does not appear in this list.

Col. **Hase.** The estimates are submitted by the Ordnance Department, based, I presume, upon information that must have gone to the Ordnance Department from our office. The estimate of $10,000 which we are asking for is not at all for the purposes that appear here in the record; $6,325 is for new cable—a 5 per cent annual replacement.

Col. **Brigham.** I think, Mr. Borland, that probably came about in the same way that the error occurred, to which I called your attention, with reference to the cable for the insular possessions, where the Ordnance Department apparently took the wrong column from the estimate submitted by the office of the Chief of Coast Artillery. If you will recall, they put in an estimate for $10,000 for the insular possessions, when we were actually asking for $36,575.

Mr. **Borland.** Then there will have to be some further information sent in.

Col. **Hase.** Yes. Under date of September 17, 1917, the Chief of Coast Artillery submitted to the Chief of Ordnance data sheets to be used in preparing the annual estimates for submarine mine matériel.

The data entered under this item were as follows:

		Present appropriation.	Proposed appropriation.
Maintenance of mine material		$2,500	$3,700
Maintenance of cable			6,300
28 miles 19 condr., at $35	$980.00		
38 miles 1 condr., at $7.50	285.00		
	1,265.00		
Per cent	5		
	6,325.00	2,500	10,000

The estimates were submitted by the Chief of Ordnance and it is not known why the figures were changed to the items as they appear in the Book of Estimates.

Mr. **Borland.** You say that none of this $47,500 appropriation which is embraced in the deficiency bill has been used?

Col. **Hase.** No, sir; it is all on hand.

Mr. **Borland.** Do you intend to use it?

Col. **Hase.** We believe we will have to use it because of the fact that the nets which are now installed at Panama were made out of some old material which had been salvaged from the Canal operations. The governor took some old cable that he had used on hoisting engines and snarled it into masses which are suspended in front of the entrances to the Canal, and we do not know how long that cable obstruction is going to remain in place. It may deteriorate and we may have to send complete nets to Panama almost at any time.

Mr. **Borland**. What provision was made for paying the labor cost for these temporary nets?

Col. **Hase**. I don't know.

Mr. **Borland**. You have not been able to purchase the nets, and so on, out of this $250,000 item? You say you have not been able to get the nets out of that item, and if that is so would you be able to get the nets out of the $47,000 item?

Col. **Hase**. Some of the material that goes into the nets has been purchased and is on hand. We do all of our own construction; we do not buy the net complete; we buy the material, the shackles and clamps, and then we make our nets. The $47,500 is for the maintenance of that net for one year; the purchase of the net would come out of the $250,000 appropriation.

Mr. **Borland**. That $47,500, then, is only for the maintenance of the net?

Col. **Hase**. That is all; that is the estimate for the annual maintenance of the net.

Mr. **Borland**. You are not going to need that, then, until you get the nets out of the $250,000?

Col. **Hase**. That is right, sir.

Mr. **Borland**. That makes it one step further removed, if you are only going to use the $47,500 after you purchase the nets out of the $250,000 item?

Col. **Hase**. Well, the net material has been purchased, and some of it, I believe, has actually been shipped to Panama. If that net should be installed this year, we undoubtedly would require some of that fund for its upkeep. At Fort Monroe, for instance, our net was wrapped around the propeller of one of the Old Dominion steamers, and it was ruined. Such a condition is likely to occur in any of our harbors where we have a net installed.

Mr. **Borland**. But no expense for maintenance will begin until you get the net installed?

Col. **Hase**. No, sir.

OPERATION AND MAINTENANCE OF FIRE-CONTROL INSTALLATIONS.

Mr. **Borland**. The next item is "For operation and maintenance of fire-control installations at seacoast defenses." You had $10,000 in the regular bill of 1918. What is the state of your appropriation?

Col. **Hase**. The unobligated balance of that appropriation this morning was reported to me as being $1,324.42. It is expected that all of that money will be expended or obligated before the close of this fiscal year. They have some requisitions which have been received but which have not yet been acted upon.

Mr. **Borland**. Is that the upkeep item for your fire-control installation?

Col. **Hase**. Yes, sir.

Mr. **Borland**. What is meant by the word "operation"? Does that have any bearing or is it all maintenance?

Col. **Hase**. It is all maintenance.

Mr. **Borland**. You are asking this year for $25,000.

Col. HASE. Yes, sir. We are doing that for the reason that we expect that the Chagres River batteries will be installed. The 16-inch gun batteries on B have been emplaced during the year, and also these modifications and extensions of the original fire-control project, which have been approved by the Secretary of War, are all underway, and we had hoped that they would be completed before June, 1919, and therefore we come for a larger maintenance item. All of that must be taken into consideration, as well as the increased cost of material.

Mr. GOOD. But we gave you an increase from $5,000 to $10,000 on the ground of the increased cost of material last year.

Col. HASE. Yes, sir; but you will note too that we got an appropriation of $5,000 in 1917, and then we had to come in for a deficiency of $5,000.

Mr. BORLAND. That made $10,000 for that year, and you got $10,000 in 1918?

Col. HASE. Yes, sir.

Mr. BORLAND. That gave you $10,000 for those two years?

Col. HASE. Yes, sir; Maj. Evans will remember the difficulty we have had in the maintenance of the Panama equipment because of the fact that our funds were always low. We sent back—I do not know how many—requisitions because of lack of funds, and the result was that the officers were paying out of their own funds for material to keep their batteries in shape.

AIRPLANES.

(See pp. 495, 531.)

Mr. BORLAND. General, have you this item "For the purchase, manufacture, maintenance, operation, and repair of airships and other aerial machines, buildings for equipment, and other accessories necessary in the aviation section for use in connection with the seacoast defenses of the Panama Canal"?

Gen. SALTZMAN. Yes, sir.

Mr. BORLAND. You had an item in the last bill of $500,000?

Gen. SALTZMAN. Yes, sir.

Mr. BORLAND. What is the state of that appropriation?

Gen. SALTZMAN. Well, Mr. Borland, I can not tell you. I was just detailed to the aviation section a week ago to-day, and the information I got by telephone was that I would be called up here about the item of $466,000 in connection with the establishment of some barracks and quarters at Manzanillo Bay in the Canal Zone. I do not know anything about this and did not bring any information about it.

Mr. BORLAND. We would like to have some one explain to the committee what has been done under this prior appropriation.

Gen. SALTZMAN. I will have to get somebody from our financial department to answer that, because I know nothing whatever about it. I have simply been detailed in this division of military aeronautics about a week, and Gen. Kenly, who is in charge of the department, is out of the city, and I was called up here because he was not here. I can have a man, who knows all about this point, here at any time you want him, sir.

BARRACKS AND QUARTERS FOR AERO SQUADRON.

Mr. BORLAND. Let us hear about the $466,000 item.

Gen. SALTZMAN. An aero squadron is stationed at Panama, consisting of about 150 enlisted men. They have all of their equipment there, but they have never been provided with barracks and quarters. They are now occupying buildings that do not belong to them and the military authorities in Panama made a request on the War Department that barracks and quarters be provided for this aero squadron. These papers went to the construction division, of which Col. Marshall is in charge, and an estimate was submitted for this sum.

Mr. BORLAND. What have they been living in down there?

Gen. SALTZMAN. The squadron is now quartered in a building called, I think, the military guard building, and they want them to get out of there. It does not belong to them, but belongs to another organization.

Mr. BORLAND. This sum is not for hangars.

Gen. SALTZMAN. No, sir; it is not for any technical buildings. All the technical buildings, hangars, and that sort of thing, come out of the aviation fund.

Mr. BORLAND. Who has the plans and estimates for those buildings?

Gen. SALTZMAN. Col. Marshall.

Mr. BORLAND. Colonel, I would like to have you explain what those buildings are to be.

Col. MARSHALL. Six sets of noncommissioned officers quarters; one field officer's quarters, four second lieutenant's quarters, and barracks for 150 men; one quartermaster storehouse, a two-story building, 40 by 60; one headquarters building, street lighting, water, etc.

Mr. BORLAND. They are to be located at Manzanillo Bay. Where is that?

Gen. SALTZMAN. Manzanillo Bay is over on the Atlantic side near Cristobal, and it adjoins the naval aviation site.

Mr. BORLAND. What is the character of the construction of these buildings—are they to be concrete buildings?

Col. MARSHALL. Yes; they are to be concrete buildings.

Mr. BORLAND. And these buildings are intended to house the men of one squadron?

Col. MARSHALL. Yes, sir. It says 6 noncommissioned officers, 21 officers, 150 men, a storehouse, and headquarters building.

Mr. BORLAND. How much is the storehouse to cost?

Col. MARSHALL. It is to be 40 by 60, a two-story building, used as headquarters and storehouse, and is to cost $91,000. I have the cost of each building.

Mr. GOOD. Give the cost of each building.

Col. MARSHALL. Quarters for 24 noncommissioned officers, $120,000; one field officer's quarters, $16,550; 16 lieutenants, $96,850; 4 captains, $39,600; 1 barrack for 150 men, $62,000; 1 quartermaster storehouse and headquarters building, 40 by 60, two stories high. $91,000; municipal works, such as street lighting, water, and so on. $40,000.

Mr. BORLAND. Those quarters average about $2,206 per individual.

Col. MARSHALL. The field officer's quarters will cost $16,550; it is a concrete house; the four captains' sets average $10,000 per officer; for the 16 lieutenants the average is about $6,000 per officer.

Mr. **Borland**. My understand was, taking officers and men, that the individual average ran between $800 and $1,000.

Col. **Marshall**. If you take the over-all estimate of the big project for the Panama Canal it is something under $800 per capita, and we will come to a very big item a little later on, and under such a big item the average per capita now is about $800.

Mr. **Borland**. Why could not this be included in that?

Col. **Marshall**. Just why I do not know; whether it is due to its isolated location, or something of that sort, I am unable to say. These estimates were prepared by the people on the Canal Zone and they must have taken into consideration the different localities. These estimates were not prepared here; they were prepared by the people on the canal and forwarded.

Mr. **Good**. Is it intended to put additional organizations down on the canal?

Col. **Marshall**. I think the organizations are there now.

Mr. **Good**. They are all there, and are all the men and officers now there housed?

Col. **Marshall**. I can not answer that question.

Mr. **Good**. Who can give us information about that?

Col. **White**. I can give you some information. The situation in regard to one of the Infantry regiments is practically intolerable, namely, the one at Camp Otis. Of course, the situation that Col. Marshall speaks of, in regard to the aviation squadron, I am not so familiar with, because I do not know exactly where they are located.

The Signal Corps proper, that is the land portion of the Signal Corps, is stationed at Corozal. When you ask whether the garrisons are housed, I will say that the garrisons are all housed, but some of them exceedingly poorly, so much so that the department commander has stated that unless something is soon done to relieve the situation in regard to some of those troops, they will have to be sent back, because it is impossible to live in tents, and impossible to live in houses unless they are properly screened. The old houses at Cascades have practically gone to the dogs. That was one of the old canal towns and it is in worse condition than the others. Empire, about a mile and a half from it, or 2 miles, and Culebra, about a mile and a half farther south, are in much better condition than Cascades.

Mr. **Borland**. You do not know where these 24 noncommissioned officers and 19 or 20 commissioned officers are quartered?

Col. **Marshall**. Where they are quartered now?

Mr. **Borland**. Yes.

Col. **Marshall**. No, sir.

Col. **White**. I am under the impression that they are quartered somewhere in the vicinity of Colon, and that they need the quarters they are now in for something else.

Mr. **Borland**. Is there very much difference between the quarters you are constructing for this aviation squadron and the quarters you are constructing for the Coast Artillery men and other people who are down there.

Col. **Marshall**. No, sir.

Mr. **Borland**. They are of the same general type of quarters.

Col. **Marshall**. They are the same as the Fort Grant type of quarters; they are specifically stated to be the same as those at Fort Grant. You understand, these estimates were prepared by the officers on the Canal Zone, and were forwarded here, and these estimates specifically state that the estimates were for the same type of officers' quarters as are to be found at Fort Grant, which is a Coast Artillery post.

Mr. BORLAND. How do they compare with the price of the quarters at Fort Grant?

Col. MARSHALL. I have not the prices of those quarters at Fort Grant with me, but they are to use the Fort Grant type throughout, and they say that was the policy followed in preparing these estimates.

Mr. BORLAND. But you have not the prices here?

Col. MARSHALL. No, sir; not here, but I can get them.

Mr. BORLAND. You are now using what kind of quarters?

Gen. SALTZMAN. These soldiers are in a building over at Cristobal called the military guard building. I do not know what that is, but it is a building intended for some other purpose; it is not intended for this particular purpose and they want them out of there.

Mr. BORLAND. Have you any information as to what it is needed for?

Gen. SALTZMAN. It is normally occupied by the military guard over in Cristobal. These soldiers are not stationed at the present time at the place where their squadron and machines are to be. They have to be transported back and forth.

Mr. BORLAND. How far are they away?

Gen. SALTZMAN. I do not know the distance

Mr. BORLAND. Have you your machines down there and the whole squadron in working order?

* * * * * * *

Gen. SALTZMAN. I think so, but I am not sure.

Mr. GOOD. How far do they have to be transported?

Gen. SALTZMAN. I do not know, sir, but a very short distance: it is probably not over a mile and a half.

Col. WHITE. As near as I can get at it, those men are in the old barracks formerly used for coast artillery barracks. It is the old De Lesseps Building, and that is a very old French building. It has been used for all sorts of purposes, and I think they are in there.

Mr. BORLAND. It was used for the engineer office at one time?

Col. WHITE. Yes, sir; and it is an old building. I understand that they now want at Colon a provost guard company. On account of conditions in Panama and Colon we must police those cities, even though we do not do it under the treaty, and I understand that the colonel of artillery has asked to have an entire company, and I think a company from the Thirty-third Infantry at Gatun has gone down there, and they act as a police force in Colon and Cristobal. That is probably what they want the building for, and that means the driving of the aviation people over on the other side of Manzanillo Bay, where I understand their post is.

Mr. BORLAND. Now, gentlemen, you want to take up these estimates for barracks and quarters.

Col. MARSHALL. Yes, sir. I think I can in a few words make clear the sequence of events. The estimates originally submitted were in two parts, one for cantonments and the other for miscellaneous construction. The one for cantonment, construction is $1,954,560, and the one for miscellaneous construction, other than cantonments, was $1,825,800. Subsequently, and after those estimates had been submitted to Congress, correspondence with the Canal Zone was had to get estimates for the permanent location of the troops for the permanent garrison.

Subsequently, in place of that estimate of $1,954,560, we submitted estimates for permanent construction for the permanent distribution of the troops, or for those same troops, numbering approximately, 9,800, amounting to $13,211,180. Hence, it is necessary that either the estimate of $1,954,560 stand or that the estimate of $13,211,180 stand. They are alternate estimates. The estimate of $1,825,880 is for miscellaneous construction, some of which can be excluded if the estimate of $13,211,180 goes through, and other portions of which can be excluded if the cantonment estimates go through.

Mr. **Borland**. Some of the estimate of $1,825,000 can be excluded if the estimate of $13,211,180 is appropriated.

Col. **Marshall**. Yes, sir. Some of that estimate is also estimated for under the permanent construction.

CANTONMENT CONSTRUCTION.

The **Chairman**. This item appears on page 14 of the bill:

"For the necessary cantonment-camp construction, including water and sewer systems, roads, walks, and so forth, required for the accommodation of three regiments of Infantry; one regiment of cavalry; one battalion headquarters, and two companies signal troops, for regimental headquarters' engineer regiment, and one battalion of engineers; one telegraph company; one ambulance company; one brigade headquarters, $1,954,560."

That is the item to which you have referred?

Col. **Marshall**. Yes, sir.

Mr. **Borland**. Now, as I understand you, this item of $13,211,180 in the supplemental estimate is for permanent quarters for the same troops for whom quarters were estimated in the item of $1,954,560?

Col. **Marshall**. Yes, sir.

Mr. **Borland**. And if one is given, the other need not be given?

Col. **Marshall**. Yes, sir; that is true. I would like to state in connection with the estimate of $1,954,560 that the number of troops figured on is approximately 9,800 men, and that estimate is not enough by 100 per cent and more. The cost of cantonment construction in this country is approximately $325 per man, and that, for 9,800 men, would amount to $3,159,000. The cost of construction in Panama is greater than it is in this country, but how much greater I do not know. I should say, however, that it would be 25 per cent more. Therefore, if cantonment construction is authorized for 9,800 men, that amount should be $3,973,706 in lieu of the $1,954,560. I am not advocating cantonment construction.

Mr. **Borland**. What you mean to tell the committee is that this regular estimate of $1,954,560 that was transmitted is not correct anyway?

Col. **Brett**. It is wholly insufficient.

Mr. **Good**. Was it estimated originally to construct cantonments for the number of men that you have just stated?

Col. **Marshall**. Yes, sir.

Mr. Borland. Was this cantonment construction intended to cover the same number of men that you are now figuring on?

Col. Marshall. Yes, sir; but it was estimated over a year ago. It was doubtless estimated on the same method that we used in Texas of providing buildings that were nothing but shells, and not anywhere near the same cantonment construction that we have gone into. I assume that is the case, although I do not know it to be the case.

Mr. Slemp. Do you not regard the cost of cantonment construction in this country as rather excessively high, due to the pace at which it has to be done, and that, therefore, $325 per man might be high?

Col. Marshall. No, sir. The normal cost of city waterworks is somewhere between $60 and $75 per capita. That is the per capita cost of water alone in the cities of this country. At every cantonment we have constructed we have had to construct a complete water system, even where we took it from cities, because we have had to put it in booster plants and chlorinating plants. As a matter of fact. the cost of our water-supply system has been lower per capita than has been the cost of the same utility in the cities. Our water supply has cost us about $15 per capita. That is due largely to the fact that we use wood pipe instead of iron pipe, as they use in the cities. Then. provision must be made for sewage and sewage disposal, and you can get some idea of it from your own experience of the cost per capita of building a cottage. These cantonment buildings compare very favorably with cottage construction.

Mr. Borland. Now, it appears that the War Department has not assisted the Appropriation Committee very much in its method of sending in these estimates. It has sent in three estimates here, all of which are conflicting. The first estimate sent in for $1,825,880, is the regular estimate for the construction of barracks and quarters, but it comes out that that is simply for the miscellaneous program.

Col. Marshall. I have them here, item by item.

Mr. Borland. Then the department sends in an estimate for $1,954,560, which is supposed to be for cantonment construction for the troops. Then it submits a third estimate for $13,211,180 which covers the larger portion of the originl estimate of $1,825,000, and which is in lieu of or alternative to all of the estimate $1,954,560.

Col. Marshall. Yes, sir.

Mr. Borland. But there is nothing in the estimate of $13,211,180. or in the paper sent with it, indicating any such fact.

Col. Marshall. They should have set that out.

Mr. Borland. Nothing is said about it. The letter of transmittal states——

> The amount estimated for is deemed imperatively necessary for the construction of the necessary buildings, water and sewer systems, roads, walks, etc., required to accommodate the mobile garrison of the zone as at present constituted.

The note states—

> This estimate is submitted in accordance with instructions of the Assistant Secretary of War under date of January 18, 1918, subsequent to the submission of the regular annual estimates.

That is all that is said on the subject, leaving the Committee to straighten out the bearing that these three estimates have on one another.

Col. WHITE. I might say in regard to that, that sometime ago I was called up by the Chief of Staff's office and was asked to come before the committee and explain those estimates in connection with the Panama Canal. I did not know anything about the form in which the estimates came. I came up here one day to explain the matter, and that is the last I heard of it. A General Staff officer came down with these estimates and said he was very anxious for somebody familiar with Panama to come up before the committee and make a complete statement. I was wanted to explain them, and I was requested to do so.

Mr. BORLAND. I am pointing out the fact, which appears very clearly, that the War Department has estimated for the same sets of quarters on two different bases, one for cantonment construction and the other for permanent construction, and that they sent both of those estimates in here without any recommendation or explanation in regard to them.

Col. WHITE. I might say in addition that the papers show that we were to appear before the committee.

BARRACKS AND QUARTERS, WATER SYSTEM, ROADS, WALKS, ETC.

Mr. BORLAND. If the department gives us our choice, we will have to take it. Now, what do you intend to build with the $13,211,180?

Col. MARSHALL. Concrete buildings. Those buildings to be constructed under the estimate of $13,211,180 are to be located, some at Diablo, some at Miraflores, and some at Gatun. These troops are on the west side of the canal, and they are to be moved to those places [indicating]. There is to be a ferry across the canal here [indicating] and a ferry here [indicating], so that the troops can go over to the west side. Now the troops who are on the west side can only go to the east side on the railroad, and the bridge is frequently open because of ships passing through the canal all the time. The question as to when the railroad can operate is subject to the condition of ships passing through the canal.

These ferries are supposed to have two ferry boats, so that the troops at each end of the canal can be moved over at any time. The location that was proposed under the cantonment idea was that they should be put here [indicating] north of the Corunda River. That is at this end of the canal [indicating], and there will be artillery up here at Gatun. The distribution under the permanent scheme, under the estimate of $13,211,180, is set out in full and can be put in the hearings, if you want it. It is a well-digested statement covering the location of the permanent garrison of the canal. It is the proposed garrison for the troops enumerated in the statement which you read a few minutes ago.

Mr. BORLAND. How much of that amount is for supplementary buildings, or how much is for general buildings?

Col. MARSHALL. I can read off the list of construction here.

BALBOA, CANAL ZONE, *September 11, 1917.*

Estimate of the cost of proposed Army construction work to accompany preliminary report of the board of officers convened by Special Orders No. 71, headquarters, United States troops, Ancon, Canal Zone, dated June 25, 1917.

	Sets.	Number of buildings.	Type.	Stories.	Size (feet).	Unit cost.	Cubage (cubic feet).	Revised total estimates.
1. Headquarters, Quarry Heights:								
Headquarters' building		1	Frame	2	60 by 165	$0.15	346,500	$52,000
Lieutenants' quarters	2	2	Frame, T-21	2	34 by 43	.125	71,900	14,000
Captains' quarters	2	2	Frame, T-20	2	42 by 47	.17	53,400	18,000
Noncommissioned officers	12	3	Frame, T-14	2	30 by 76	.132	60,400	24,000
Garages		2	Frame; 20-stall, concrete	1	20 by 200	[1] 200.00		8,000
Stables		1	Frame; for 48 animals	1	27 by 150	[1] 125.00		6,000
Municipal work								102,700
Electrical work								10,000
Total								234,700
2. Provost guard, Quarry Heights:								
Barracks	1	1	Concrete, with toilet wings; 150 men	3	44 by 120	.24	300,000	72,000
Administration building	1	1	Concrete	2	52 by 87	.24	150,000	36,000
Guardhouse	1	1	do	2	42 by 90	.205	119,000	25,000
Municipal work			Included under "Headquarters"					
Electrical work								5,000
Total								138,000
4. Pier and depot at Gatun:								
Dredged basin								85,000
Storehouse and pier			Pier, 80 by 400; storehouse, 58 by 390					325,000
Hay shed, blue print 14-13		1	Concrete	1	60 by 108	.122	129,600	15,800
Oats shed, blue print 14-13		1	do	1	40 by 54	.122	43,200	5,300
Captains' quarters	2	1	do	2	40 by 55	.242	78,490	19,000
Noncommissioned officers' quarters	12	3	do	2	30 by 75	.264	70,230	55,500
Motor-truck garage		1	Concrete; 36 trucks	1	52 by 218	.13	232,000	30,000
Total								535,600
5. Depot at Corozal:								
Captains' quarters	4	2	Concrete	2	40 by 55	.242	78,490	38,000
Quartermaster storehouse		1	do	2	100 by 400	.182	1,400,000	255,000
Hay storehouse		1	do	1	160 by 120	.10	1,555,200	41,000
Oats storehouse		1	do	1	100 by 60	.10	504,000	12,000
Shop		1	do	1	40 by 285	.122	205,000	25,000
Garage		1	Concrete, 36 trucks	1	52 by 218	13	232,000	30,000

Noncommissioned officers' quarters	28	7	Concrete	2	30 by 75	.264	70,230	129,500
Barracks for employees		1	Concrete, with toilet wings	3	40 by 144	.20	360,000	72,000
Incinerator and manure pits		1	Concrete: 40-ton capacity					45,000
Remodeling Balboa Pier								
Municipal work (included under "Engineer Corps").								
Electrical work (included under "Engineer Corps").								
Total								647,500
6. Ferries:								
3 ferry slips at Gatun, Fort Sherman, and spillway								59,500
2 ferry slips in Lake Miraflores								44,000
Total								103,500
7. (*b*) Two regiments of Infantry at Gatun:								
Colens' quarters	2	2	Concrete	2	38 by 45	.295	60,886	36,000
Field officers and captains' quarters	48	24	do	2	40 by 55	.242	78,490	456,000
Lieutenants' quarters	48	12	do	2	36 by 90	.193	114,275	264,000
Lieutenants' bachelor quarters	12	2	do	2	38 by 83	.305	116,257	70,000
Noncommissioned officers' quarters	48	12	do	2	30 by 75	.264	70,230	222,000
Barracks, each for 1 battalion		6	Concrete, with toilet wings	3	44 by 480	.17	1,172,400	1,162,400
Barracks, each for 3 companies		2	Concrete	2	44 by 396	.17	601,128	204,200
Regimental headquarters buildings		2	do	2	51 by 336	.16	606,186	194,000
Stables for brigade		6	2-54, 2-35, 2-123; 424 stalls			[1] 125		53,000
Wagon sheds for brigade		2	2-29: 58 stalls			[1] 200		11,600
Incinerator and manure pit		1	20-ton capacity					20,000
Municipal work—								
Clearing and grading								94,800
Water								213,000
Sewers, storm and sanitary								162,600
Walks and roads								332,800
Grading contiguous area								6,250
Railroad tracks								12,500
Electrical work								292,500
Total								3,807,650
8. (*b*) Three regiments of Infantry, Miraflores:								
Colonel's quarters	2	2	Concrete	2	38 by 45	.295	60,886	36,000
Field officers' and captains' quarters	48	24	do	2	40 by 55	.242	78,490	456,000
Lieutenants' quarters	48	12	do	2	36 by 90	.193	114,275	264,000
Lieutenants' bachelor quarters	12	2	do	2	38 by 83	.305	116,257	70,000
Noncommissioned officers' quarters	48	12	do	2	30 by 75	.264	70,230	222,000
Barracks, each for 1 battalion		6	do	3	44 by 480	.17	1,172,400	1,162,400
Barracks, each for 3 companies		2	do	2	44 by 396	.17	601,128	204,200
Regimental headquarters building		2	do	2	51 by 336	.16	606,186	194,000

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[1] Per stall.

Estimate of the cost of proposed Army construction work to accompany preliminary report of the board of officers convened by Special Orders No. 71, headquarters, United States troops, Ancon, Canal Zone, dated June 25, 1917—Continued.

	Sets.	Number of buildings.	Type.	Stories.	Size (feet).	Unit cost.	Cubage (cubic feet).	Revised total estimates.
8 (*b*) Three regiments of Infantry, Miraflores—Con.								
Stables for brigade		6	2-54, 2-35, 2-123; 424 stalls			[1]$125.00		$53,000
Wagon shed for brigade		2	2-29; 58 stalls			[1]200.00		11,600
Incinerator and manure pit		1	Concrete, 20-ton capacity					20,000
Municipal work—								
Clearing and grading								56,250
Water								54,230
Sewers								74,850
Walks and roads								170,630
Grading contiguous area								5,000
Electrical work								216,000
Total								3,270,160
9. (*b*) One regiment Mountain Artillery:								
Magazine		1	Concrete	1	24 by 26	.21	9,360	2,000
Magazine		1	....do	1	7 by 9	.65	760	500
Stables		3	3-176; 528 stalls			148.00		78,200
Gun sheds		3	1, 3-30; 90 stalls			200.00		18,000
(*f*) Municipal and electric work for entire brigade:								
Clearing and grading								7,200
Water								5,000
Sewers								10,000
Roads and walks								28,720
Railroad tracks								15,000
Electrical work (included in Cavalry estimate).								
Total								164,620
11. Regiment of Cavalry, near Diable Hill:								
Colonel's quarters	1	1	Concrete	2	38 by 45	.295	60,886	18,000
Field officers' and captains' quarters	20	10	....do	2	40 by 55	.242	78,490	190,000
Lieutenants' quarters	20	5	....do	2	36 by 90	.193	114,275	110,000
Lieutenants' bachelor quarters	6	1	....do	2	38 by 83	.305	116,257	35,000
Noncommissioned officers' quarters	24	6	....do	2	30 by 75	.264	70,230	111,000
Barracks, each for 1 squadron		3	....do	3	44 by 384	.17	957,800	489,000
Barracks, each for 3 troops		1	....do	2	44 by 468	.17	710,400	120,000
Regimental headquarters building		1	....do	2	51 by 300	.16	541,200	86,600
Stables		10	10-108; 1,080 stalls			[1]130.00		140,400
Incinerator and manure pit		1	Concrete; 40-ton capacity					40,000

Municipal work—								
Clearing and grading								120,000
Water								217,700
Sewers								187,800
Roads and walks								216,400
Clearing contiguous area								6,250
Railroad tracks								15,000
Electrical work								300,000
Total								2,403,150
12. Regiment and train company of Engineers:								
Field officers' and captains' quarters	6	3	Concrete	2	40 by 55	.242	78,490	57,000
Lieutenants' quarters	12	3	do	2	36 by 90	.193	114,275	66,000
Noncommissioned officers' and clerks' quarters.	20	5	do	2	30 by 75	.264	70,230	92,500
Barracks, each for 1 battalion		1	do	3	44 by 464	.17	1,012,200	177,000
Barracks, for 2 companies		1	Concrete with toilet wings	3	51 by 240	.17	643,100	107,400
Main depot storehouse		1		1	55 by 120	.10	165,000	16,500
Searchlight storehouse		1		1	50 by 100	.10	120,000	12,000
Garage and motor shop		1			25 by 50	.10	30,000	3,000
Depot office		1			24 by 50	.10	30,000	3,000
Wagon shed		1			30 by 120	.055	65,000	3,600
Animal infirmary		1	30 box stalls, operating room, laboratory quarters, etc.					18,000
Municipal work—								
Clearing and grading								18,000
Water			Includes engineers, sanitary signal and Quartermaster Corps.					38,500
Sewers								42,000
Roads and walks								186,600
Clearing contiguous areas								2,500
Railroad tracks								9,200
Electrical work								85,000
Total								937,800
13. Signal troops (1 field battalion and 1 telegraph company):								
Noncommissioned officers and clerks quarters	4	1	Concrete	2	30 by 75	.264	70,230	18,500
Supply depot and storehouse		1	do	1	50 by 100			20,000
Total								38,500
14. Medical reserve depot		1		1	50 by 100			20,000
16. Roads, to connect posts at south end								300,000

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[1] Per stall.

Estimate of the cost of proposed Army construction work to accompany preliminary report of the board of officers convened by Special Orders No. 71, headquarters, United States troops, Ancon, Canal Zone, dated June 25, 1917—Continued.

SUMMARY.

	Revised total estimates.
1. Headquarters, Quarry Heights	$234,700
2. Provost guard, Quarry Heights	138,000
4. Pier and depot at Gatun	535,600
5. Depot at Corozal	617,500
6. Ferries	103,500
7. Two regiments Infantry at Gatun	3,807,650
8. Two regiments Infantry at Miraflores	3,270,160
10. Artillery, Diablo Hill	164,620
11. A regiment of Cavalry, near Diablo Hill	2,403,150
12. Regiment and train company of Engineers	937,800
13. Signal troops	38,500
14. Sanitary troops	20,000
16. Roads to connect posts, south end	300,000
17. Contingencies	500,000
18. Two ferry boats	110,000
Total	13,211,180

Mr. **Borland.** How much is your cost per soldier for the barracks themselves?

Col. **Marshall.** I do not know. This $3,870,650 includes not only the barracks but the water supply and the other things about them. For 4,000 men that would be about $950 per man.

Mr. **Borland.** How does that compare with your cost of construction of barracks in this country?

Col. **Marshall.** I know of no place except Fort Sill where we have constructed completely a whole new post and I can not recall what that cost was per capita. Where you construct a building all off to itself, it is a very different thing from constructing a whole layout. I should say that a concrete building would possibly cost $3.50 a square foot, and we allow about 60 square feet over all per man. A concrete building would cost about $3.50 per square foot, so that would be 60 times $3.50, or $210 per man for that type of building in this country. But as to the adjuncts I just do not know; I can not answer your question without looking up the records.

Mr. **Borland.** In that cost do you include the plumbing and heating?

Col. **Marshall.** Yes, sir; the heating pipe, but not the heating plant.

Mr. **Borland.** You do not include the auxiliary buildings, and you do not include the walks, grounds, and grading?

Col. **Marshall.** No. I can look up the records and have that put in the record.

Mr. **Borland.** Is the report in such detail as to show that the estimates have been made in view of locating these buildings on the grounds where they are intended to be placed, taking into consideration all of the difficulties and peculiarities of the location, and estimating for the special buildings?

Col. **Marshall.** Yes, sir.

Mr. **Borland.** You have $260,000 for what?

Col. **Marshall.** $234,700 for the headquarters at Quarry Heights.

Mr. **Borland.** Is that the headquarters' building?

Col. **Marshall.** It includes the headquarters' building, the field officer's quarters, the quartermaster's quarters, garages, municipal work, and electrical work.

Mr. **Borland.** What other buildings have you there?

Col. **Marshall.** For the provost guard, Quarry Heights, barracks, administration building, guardhouse, municipal and electrical work.

Mr. **Borland.** How much are you allowing for that?

Col. **Marshall.** $5,000 in connection with that provost guard.

Mr. **Borland.** How much in the whole scheme?

Col. **Marshall.** That is a subitem.

Mr. **Borland.** You have a subitem of each item?

Col. **Marshall.** Yes. I take it they mean that municipal work to include the water supply and sewers.

Mr. **Borland.** Why have you allowed $500,000 for contingencies?

Col. **Marshall.** I can only give you my idea of why that was done. It is simply what the word indicates, for what might have been left out they put in $500,000. There is no statement in the body of the papers which shows why, but it looks to me like it is a very small percentage.

Mr. **Borland.** You think it is small?

Col. MARSHALL. Yes, sir. On a $12,000,000 project I would certainly want a contingency of more than 4½ per cent.

Mr. SLEMP. I was just wondering whether the estimate itself did not embrace the contingent feature without reference to the general features.

Col. MARSHALL. It does not indicate here. They have specified the various buildings, showing the sizes of them and the other features, and they give the cubic feet of the buildings in great detail in the tables they have presented here.

Mr. BORLAND. Why do you charge two ferryboats to barracks and quarters construction?

Col. MARSHALL. This is not an appropriation entirely for barracks and quarters. When we submit an estimate for the sundry civil bill for any project we charge in that estimate everything that goes to make up the project. Whenever we have submitted an estimate for the sundry civil bill that has been the practice followed, at least ever since I have known anything about it.

Mr. BORLAND. Where are these boats to be used?

Col. MARSHALL. One at Gatun and the other one at Miraflores, in order to get from the east side to the west side of the canal.

Mr. BORLAND. Are they solely for the troops?

Col. MARSHALL. There is nothing in these papers to indicate to the contrary.

Col. WHITE. I might say that there is a small amount of business transacted across the Miraflores lock. The Miraflores lock is so constructed at one portion of it that you can pass wagons—rather small wagons—over it, so that you can get artillery across it. There is a small amount of traffic that comes from the west side of the canal and goes across the lock, and the ferries are to be used for that small amount of traffic. It does not amount to much.

Mr. BORLAND. Is it intended that these two ferryboats shall be operated by the post commander?

Col. MARSHALL. The ferryboats and tugs at all of the places are operated by the quartermaster under the post commander, and these will be operated in the same way. You take all of the harbor boats, in the New York Harbor and in the Boston Harbor, as well as other places, and they are operated in that way.

Mr. BORLAND. I asked a moment ago whether it was intended that these boats should be used solely by the troops. The colonel says there is some little business across the locks. What do you know about that?

Col. MARSHALL. I do not know anything about that. I know that we have a ferryboat running from New York City to Governors Island and that boat does all of the business incident to Governors Island, and some of that is commercial, of course.

Mr. BORLAND. Would it not be necessary to have a commercial ferry at both of these places, at Gatun and Miraflores?

Col. MARSHALL. I can not answer that.

Col. WHITE. Not at Gatun because there is no traffic across the canal at Gatun, and that section of Panama is almost uninhabited, so that there is very little traffic, almost none, there. However, there is some traffic back and forth across the canal, and there is some feeling on the part of the Republic of Panama that we have cut their country in two and not made adequate connections for the two different portions of the Republic across the portions that have been split, so that there is some feeling that there should be some kind of a bridge that could be used if the Panamaians wanted to use it, but, according to my idea, a ferry would be better, at least, there should be a ferry at Miraflores for the accommodation of what little civilian traffic there might be across there.

Mr. BORLAND. There is still a bridge at Empire, is there not?

Col. WHITE. That is only a railroad bridge and nothing else. It is just a pontoon bridge, the old bridge having passed away. The bridge is now at Paraiso, about 2 miles from Empire.

Mr. BORLAND. There is no wagon bridge there at all?

Col. WHITE. No, sir. As I say, both of the end locks of the canal, the one at Gatun and the one at Miraflores, have large gates that allow ponies and small wagons to cross, but just one gate in each of the two sets of locks.

Mr. BORLAND. How much are those boats to cost?

Col. MARSHALL. $55,000 each.

Mr. BORLAND. What is their size?

Col. MARSHALL. They are described as being somewhat smaller than the boat that runs from Governor's Island to New York.

Col. WHITE. They are supposed to be large enough to carry good-sized artillery.

Mr. BORLAND. What accommodations exist for the troops at the present time?

Col. MARSHALL. I have not that information.

Col. WHITE. The troops now at Corozal, the odds and ends, the cavalry, the ambulance, the artillery, the signal corps and the engineers, are fairly well provided for, they are a little bit crowded, but not uncomfortable and not insanitary. At Culebra, the Twenty-ninth Infantry is not in very bad shape. They have moved a number of buildings, due to the slides. Empire is in rather fair shape. The buildings at both Culebra and Empire are old, but the troops are not uncomfortable, and the buildings are not really insanitary. At Cascades, Camp Otis, the quarters occupied by the Porto Rican regiment, which relieved the Tenth Infantry, are practically untenable, and that is no doubt the reason why the commanding general remarked that unless something is done to relieve the situation some of the troops will have to be relieved from duty on the Canal Zone. I think that remark applied principally to Camp Otis.

Mr. BORLAND. How many men are at Camp Otis.

Col. WHITE. This regiment of Porto Rican infantry, which I think is now up to the full size, some 1,955 men. At Gatun the soldiers have taken the old negro quarters and spent, I think, about $99,000 and have housed themselves in such a way that with the exception of the bedbugs they are not uncomfortable, and probably the surroundings are not insanitary.

Mr. BORLAND. What do you say as to the advisability of canton ment construction?

Col. WHITE. I am against it, sir. I do not see any reason for cantonment construction unless they want to take this regiment at Camp Otis and put up some cantonment construction for it. I believe that if you are going to build anything at all, you might as well increase the cost a little and commence to build permanent construction instead of cantonment construction. The amount indicated here is to my mind, insufficient to house the troops with comfort, due to the fact that I do not think the estimate is large enough to answer the water question, and then you have got to be very careful of the mosquitoes.

Mr. BORLAND. What has become of that old cantonment they had at Bas Opispo?

Col. WHITE. I will tell you the work that the army has had to do down there. We have taken every little piece of lumber that we could get, which the canal gave us, and used it for construction purposes. For instance, to explain what was done in putting the troops into decent houses at Corozal. Corozal is a nice little town and somewhat more modern than Empire and Camp Otis. We began to put more troops in there than we had room for, and when the Ancon Hospital was torn down and new buildings put up in place of the old French buildings, we took the lumber that was not going to be used by the canal authorities and carried it back to Corozal and the houses were fixed up with it by the soldiers themselves. That was done with regard to Bas Obispo and some of it was used at Camp Otis. Another great mass was taken down and used in constructing the provost guard at Balboa Heights—that is, Quarry Heights—and the provost guard building there now was made out of that stuff.

Mr. BORLAND. Then, there is practically nothing at Bas Obispo?

Col. WHITE. Everything at Bas Obispo that was worth putting on the cars and paying freight on was taken to Balboa and used at the headquarters there, and I think some of it went over as far as Gatun.

Mr. BORLAND. You think, then, it would not be advisable to enter upon cantonment construction at all, for two reasons: First, because you think the estimates here are too low, and, second, because cantonment construction would not answer the purposes?

Col. WHITE. Yes, sir. I do not favor it. If we are going to have cantonment construction at all, something must be done for the troops at Camp Otis. I can remember when a number of you gentlemen came down there and one of you climbed under some of the old buildings at Camp Otis to see exactly how badly the ants had eaten them away, and they are in bad shape. Something must be done for Camp Otis. Of course, there could be cantonment construction for that regiment, but I believe it is desirable in the long run to start right in and construct decent quarters for them—that is, permanent quarters.

Mr. BYRNS. I got the impression that your chief objection was that you thought these quarters ought to be made permanent.

Col. WHITE. Yes; my idea is that as long as you are going to build—and something must be done for these people at Camp Otis—that you might as well make it permanent. I think the difference in cost is not enough to warrant the cheaper construction.

Mr. SLEMP. Have you any estimates for permanent buildings at Camp Otis, if it should be decided to build there alone?

Col. WHITE. The estimates that have been submitted here, amounting to $13,000,000, contemplate, as I explained this morning, for strategic reasons, the withdrawing of the troops from the west side of the canal and putting them all on the east side, putting two regiments, with permanent construction, at the Miraflores Lock, and two regiments at Gatun. So that is included in the estimate, two regiments of Infantry at Gatun, $3,807,000, and two regiments of Infantry at Miraflores, $3,270,000. I do not know why there is a difference of some $500,000, except that Miraflores is a little bit flatter than Gatun, and that might be the occasion for the difference in cost.

Mr. GOOD. Out of what fund has the maintenance of the buildings now occupied by the troops been paid?

Col. WHITE. The general fund, I guess, of repairs and maintenance. We spent quite a great deal of money, as I understand it, at Empire and Culebra, and particularly at Camp Otis.

Mr. GOOD. Just for maintenance?

Col. WHITE. Yes; just to keep up those old buildings, and, as I say, we used old lumber whenever we could.

Mr. GOOD. What did that amount to?

Col. WHITE. I have no idea.

Mr. GOOD. Is there any source from which that information could be determined?

Col. WHITE. Yes; from the Quartermaster's office.

Col. BRETT. We could determine it by going over the accounts and segregating the different items.

Mr. GOOD. You can put that information in the record.

Mr. BYRNS. You no doubt have already stated it, but I want to ask, for my own information, what would be the difference in the cost of cantonment construction and the permanent concrete construction, in round figures. If you have stated it, I do not want to delay the committee with it.

Col. WHITE. No, I do not believe I stated it exactly, because I do not precisely know. They have for cantonment construction $1,900,000, or something like that, for the number of troops on the Canal; for the same number of troops here we have an estimate of $13,000,000. Of course, about $3,000,000 of that is, roughly speaking, outside of quarters for the troops, so it would seem to be about one to five.

Mr. BYRNS. It would cost about five times as much for the concrete construction as it would for the cantonment construction?

Col. WHITE. Yes, sir; but I think that is a little bit too low.

Mr. BYRNS. If your estimate for the cantonment construction is too low, the proportion would not be so great.

Col. WHITE. No; that is exactly my idea.

Col. BRETT. It is about two and a half to one.

Mr. SLEMP. There is a difference of about $700 per man.

Col. MARSHALL. About $600.

Mr. SLEMP. $325, and the other would be about $1,000.

Col. MARSHALL. Yes; if it is $325 in this country, I would say it would be nearer $400 in Panama.

Col. WHITE. I might say one more thing about this $13,000,000. When Gen. Edwards started on this business of construction in Panama, his idea was to build frame buildings, and the buildings for the headquarters that now exist at Quarry Heights, the brigade headquarters and the department headquarters, are all of frame. They are very satisfactory houses and very confortable to live in, much more so than the concrete houses at the coast artillery posts, but Gen. Wood wanted concrete barracks, because he could put them closer together, on account of less danger of fire, and consequently would have to spend less money on roads and sewerage.

Mr. BYRNES. Is there any difference, so far as the period of time that they will last is concerned, between a frame building in Panama and a frame building in this country?

Col. WHITE. Well, you will get as many different opinions on that that point as the people you ask. I have seen old French buildings that have lasted a long time. The buildings of the Ancon Hospital, of course, were roofed with tile, which is a great protection, so that no water gets through the roof, and those buildings lasted some 30 or 40 years, but there are other buildings, like those at Camp Otis, which have gone to pieces rapidly. I would be inclined to think that on account of the heavy rains in Panama, and then when the rains have ceased the excessive heat, and the ants, that the life of a frame building in Panama is much shorter than it is in this country.

Mr. GOOD. What was the plan in connection with erecting concrete buildings for the troops—large buildings with a great number of rooms in each building?

Col. WHITE. Not a great number of rooms in each building, but large rooms, big rooms in order to get the benefit of whatever breezes there might be, and not a number of small ones. Take the contemplated construction at Miraflores. They speak of two regiments of Infantry, the colonel's quarters, the field officer's quarters, batchelor quarters, noncommissioned quarters, barracks, one for each company. They are going to put four companies in each one of those barracks. They are three stories high. Gen. Wood took that into consideration because he has enough information and experience in tropical living to know that you can not crowd men too thick. He took that into consideration when he told the general he wanted concrete construction.

Mr. SLEMP. Colonel, if the cantonment construction in this country were to be gone over in the light of your experience now, considering the materials and opening the matter up to public competition in any way you could effect economies, do you think you could construct the cantonments at less than $325 per individual?

Col. MARSHALL. If we had a year to do it, we could.

Mr. SLEMP. I am assuming you had plenty of time. Could you not apply that same principle down in Panama, where you will have plenty of time to do this work and to seek the particular contractor you want and the materials, and so on, and get the cost down less than you have stated? You are basing the cantonment cost down there upon your experience here, are you not?

Col. MARSHALL. Yes.

Mr. SLEMP. And I was wondering if you would not modify your experience here by time and other conditions, so as to make the estimated cost down there much less.

Col. MARSHALL. If that was permitted it could be reduced somewhat, but, as I understood, one of the ideas of the cantonment construction would be to get it done as quickly as possible. That would be one of the reasons for it.

Mr. SLEMP. There would not be any necessity so far as the approach of winter was concerned or getting the men into sheds or anything of that sort.

Col. MARSHALL. No. It is just possible that the work down there under the conditions there could be done for the same that the work here was done for.

Mr. **Slemp.** Your suggestion in regard to the cost of the cantonments there is really based upon your experience here of last year and not upon any estimate made as to the cantonment construction?

Col. **Marshall.** That is correct.

BARRACKS AND QUARTERS, STOREHOUSES FOR COAST ARTILLERY.

Mr. **Borland.** You have another supplemental estimate here of $181,335 for barracks and quarters, storehouses, etc., Canal Zone.

Col. **Marshall.** They are certain Coast Artillery items. Col. Hase can probably answer as to the necessity for that.

Col. **Hase.** In the main this covers some barracks and quarters and then various auxiliary buildings, itemized as follows: At Fort Grant, for the construction of quarters for the master and chief engineer of the steamer *General Getty*. This is a harbor boat and there are no quarters available at Fort Grant for the master and engineer of the boat. It was said yesterday that the Panama Canal furnishes quarters to its employees, and under existing orders from the War Department the quartermaster employees have been placed upon the same general conditions as the Panama Canal employees. No quarters can be hired for these employees except in the city of Panama, where the rents are exorbitant. It is very desirable that these men be quartered near enough to the boat so that the boat can be used in an emergency. Therefore it is proposed to erect two small frame cottages at a cost of $6,600 for the use of these two men.

At Fort Sherman there is an item for one motor engine house and for connecting the water supply and drainage at a cost of $1,600. There are two gasoline locomotives, and it is stated that these two small houses are a necessity in order that the two engines may be taken care of. Only the smallest kind of shed is contemplated.

Then an item for the construction of one double barracks to accommodate 200 men, with the water and sewer systems and walks and so on, at a total cost of $62,650. This barrack is required to provide living quarters for the two companies that are going to man the four long-range guns at the Chagres River. These barracks will be erected at Toro Point (Fort Sherman).

Then for two captains' quarters, four lieutenants' quarters, and the accessory roads, grading, sewer and water systems for the officers who will command these two companies for the two batteries of long-range guns, at a total cost of $52,585.

For certain electrical work and extensions of the existing systems to reach these new buildings, $4,000.

At Fort Randolph, a small engine house to house the two gasoline locomotives which we have over there, similar to the construction work which is contemplated at Fort Sherman.

At Quarry Heights the erection of a set of quarters for the artillery district commander, for his two staff officers, and also for two noncommissioned staff officers, and for the necessary roads, walks, water and sewer systems, total, $52,300.

The sum total of these items is $181,335.

Mr. **Borland.** Where did you say these two captains and four lieutenants' quarters were to be?

Col. **Hase.** They are to be at Fort Sherman for housing the commissioned personnel which is for these two companies of seacoast artillery which will man the four long-range guns being installed on the Chagres River.

Mr. BORLAND. The same as the $60,000 barracks?

Col. HASE. Yes, sir; they go with that personnel. That is going to be one large barrack building, sufficient to hold 200 men.

Mr. BORLAND. At Quarry Heights you are estimating for one artillery district commander quarters, $12,500.

Col. HASE. Yes, sir. He is the general commanding both coast defenses, at Balboa on the Pacific side and Cristobal on the Atlantic side. The commanding general of the Panama Canal Department desires that his residence be somewhere in the immediate vicinity of the commanding general's house which is going to be built at Ancon.

Mr. BORLAND. Why is not that item embraced with the $13,000,000 estimate?

Col. MARSHALL. The $13,000,000 estimate was for the mobile army troops only.

Mr. BORLAND. You do not include anything for the Coast Artillery.

Col. HASE. They have always been kept separate, sir.

Mr. BORLAND. But right at that particular place in Panama you can not keep them separate.

Col. MARSHALL. But the estimates have always been kept separate. All these matters that come up from the Canal go to the Chief of Coast Artillery's office and they are always kept separate from the mobile Army estimates.

Mr. BORLAND. What class of building do you build for $60,000 to house 200 men?

Col. HASE. It is a concrete, 2-story building, the same type of construction that we have at all the Coast Artillery posts down there.

Mr. BORLAND. How does that compare with the buildings they expect to build for the mobile Artillery?

Col. MARSHALL. I assume this building is located right alongside the road, with none of the attendant construction. I do not know that, but it looks like it.

Mr. BORLAND. There is a good deal of difference in the price.

Col. MARSHALL. Yes.

Col. HASE. It undoubtedly is, because of the fact that they only estimate here for a water supply $410 and for a sewer system $810. The estimates are made by the same people.

Col. MARSHALL. The estimates were made by identically the same outfit.

Mr. BORLAND. They are all made by the Canal authorities?

Col. MARSHALL. They are all made by the building section of the canal forces. Gen. Harding, the governor of the Canal, has a building section under him, and these estimates have all been prepared by the same building section, and apparently have all been prepared according to the particular location of the building itself.

ENGINEER BARRACKS.

Mr. BORLAND. Colonel, what is the estimate you have for $13,300?

Col. MARSHALL. That is for an engineer barracks, increasing the engineer battalion there.

Col. Brett. In addition to the barracks for E Company at Corozal, this is to take care of the men now quartered in an insanitary building, No. 34, to provide space for 60 men, 6,000 square feet.

Col. Marshall. And also to repair the stable occupied by Company E of the Engineers.

Mr. Borland. It has been customary to have this construction work all done by the Panama Canal people?

Col. Marshall. Yes, sir.

Mr. Borland. And that is the way you expect to do this work?

Col. Marshall. Yes, sir. They prepare the estimates and we have to take the estimates as they come.

Mr. Borland. Is it not necessary for us to put in some authority in this bill that it shall be done by the Government of the Panama Canal?

Col. Marshall. No, sir; it has been done that way right along.

Col. White. That was settled by a decision of the Judge Advocate General about a year or two ago, when it was first held that the Army should do its own building, and subsequently held that the Panama Canal could do it. There was some discussion before this committee as to whether the Army could build cheaper than the Panama Canal, and of course nobody knows. The Army quartermaster down there thought he could.

Mr. Borland. You think it is not necessary to put authority for that in the bill?

Col. White. No, sir; I do not think it is, Mr. Borland, because everything down there has been done by the Panama Canal authorities.

Col. Marshall. They have been doing it out of this same appropriation heretofore.

Mr. Borland. Who knows about this ordnance depot item?

Col. Hase. Mr. Chairman, before we leave this, I am afraid if this $1,825,880 estimate should fail, that the Coast Artillery would lose out on some necessary items which we have in that estimate. These amount to $153,260.

BUILDINGS, ETC., FOR COAST ARTILLERY.

Mr. Borland. I would suggest that you send this committee a letter stating what items of yours are included in that $1,825,000 item.

Col. Hase. Yes, sir; because of the fact that we are not included in the $13,000,000 estimate at all.

In order that you may know what items pertain to the Coast Artillery and which were included in the $1,825,880 estimate, but are not in the $13,000,000 item, I tabulate the following:

Fort Grant: For construction of a covered coal bin	$2,250
As there is no available covered coal bin at this post, the coal is purchased in 25-ton lots and is left in the railroad car until used.	
For construction of a quartermaster storehouse	30,000
The present storehouse is inadequate for the storage of the supplies and property pertaining to the post. There are 11 companies of Coast Artillery and 1 band stationed here, and barracks are being constructed for 3 additional companies. The total number of Coast Artillery enlisted men to be quartered here is 1,172.	

For construction of an ordnance repair shop	$11,250
One of these shops is required in each coast defense command. The shop contains lathes and shapers for the repair of the heavy armament.	
For construction of two garages, each to hold six cars	4,500
For construction of a stable	11,250
The capacity of the present stable is 20 stalls. There are 29 animals at the post, and with the authorized mounts for field and staff officers, the total number of animals would be 42.	
For construction of a wagon shed	1,800
The present wagon shed is not large enough for the number of vehicles now on hand for transportation. The vehicles are therefore stored out in the weather.	
For construction of a garage for motor ambulance	1,500
The ambulance at the present time is housed at the quartermaster corral, at a distance from the hospital. In the rainy season, this distance proves a great inconvenience and causes considerable delay.	
For construction of a target range for Coast Artillery troops	3,000
At present the Artillery troops are required to go a distance of 16 miles to Camp E. S. Otis, a temporary post, which will be abandoned shortly.	
For furnishing and installing wagon platform scales	1,125
There are no scales within 3 miles of the post. These scales are urgently needed for weighing forage and coal.	
For construction of a railroad platform	1,125
This platform is to be used by the troops entraining for the batteries. The tracks are about 4 feet above the roadway and the car steps are about 2 feet above the tracks, making it dangerous to board or to leave the cars.	
For construction of a gasoline storage tank, with the pump and covering	1,500
The gasoline is now purchased in 500-gallon lots for motor vehicles and boats, and the mineral oil in 300-gallon lots. The covering shed is needed to furnish a storage room for the mineral oil.	
Fort Randolph: For construction of a small-arms target range for Coast Artillery troops	1,545
The coast-defense commander states "suitable ranges for the troops at the Atlantic side will more than pay for itself in the saving on transportation, as the annual cost for transporting troops to Miraflores and back will be about $1,000."	
For completion of the grading and fill on the parade ground and athletic field	30,000
The ground is full of holes, and rough hummocks prevent the use of a mowing machine and provide places for water and breeding places for mosquitoes.	
Fort Sherman: For construction of a small-arms target range for Coast Artillery (see remarks under Fort Randolph)	1,545
For construction of an Ordnance repair shop (see remarks under Fort Grant)	11,250
For construction of a necessary fill and low sea wall around parade ground and athletic field	30,000
Post authorities state "the entire area in front of the five new barracks and the headquarters building is low and swampy. A low sea wall and dirt fill over the entire area is necessary in order to use it as a parade ground and athletic field."	
For construction of a sea wall around the lagoon	7,250
The commanding officer states "a sea wall should be constructed around the lagoon at Fort Sherman. This is necessitated by the character of the soil which is being washed away very rapidly by the tropical rains, and the money which has been spent on fills is rapidly being dissipated."	
For 4,000 feet of light track to connect stations on Galeta Island with Cano-William, and for purchase of two cars	2,370
These stations are some distance from the canal where the manning details for these stations are landed. The 4,000 feet is across mud flats.	
Total	153,260

Mr. BORLAND. No; but most of the $1,800,000 is.

Col. MARSHALL. A little more than $1,000,000.

SATURDAY, JUNE 1, 1918.

STATEMENTS OF COL. J. B. DILLARD, COL. E. M. SHINKLE, ORDNANCE DEPARTMENT, AND CAPT. A. B. ROBERTS.

PURCHASE, MANUFACTURE, ETC., OF SEA-COAST CANNON, PANAMA CANAL.

Mr. **BORLAND.** You had in 1918 under the head of "For the purchase, manufacturer, and test of sea-coast cannon for coast defense, including their carriages, sites, implements, equipment, and the machinery necessary for their manufacture at the arsenals," in the regular bill for 1918, $468,000, and in the deficiency act, $1,775,000. What is the present status of those two appropriations?

Col. **DILLARD.** Under the regular act there is a balance of $173,684.36.

Mr. **BORLAND.** What kind of balance?

Col. **DILLARD.** That is a cash balance, unallotted.

Mr. **BORLAND.** How much is your allotted balance?

Col. **DILLARD.** Due on contracts, $255,465.20.

Mr. **BORLAND.** What have you been buying out of that? What were the contracts made for?

Col. **DILLARD.** The contracts were made for four barbette carriages and eight antiaircraft guns and carriages. * * *

Mr. **BORLAND.** Have you got the guns?

Col. **DILLARD.** Yes, sir; they were some old guns, model of 1895, which were on hand and which were originally built as spare guns for disappearing carriages and were modified for barbette carriages.

Mr. **BORLAND.** Will that take all of your allotted balance?

Col. **SHINKLE.** No, sir. We thought we would lump the unallotted balance of $173,684.36 and the unallotted balance of $1,574,104.92 under the act of June 15, 1917, which gives a total unallotted balance of $1,747,789.28.

Mr. **BORLAND.** What was your unallotted balance under the deficiency act?

Col. **DILLARD.** $1,574,104.92.

Mr. **BORLAND.** Now you say you wanted the unallotted balance under the regular act and the unallotted balance under the deficiency act for what purpose?

Col. **DILLARD.** We would like to keep about $300,000 of the total, leaving, say, $1,450,000 which could be turned into the Treasury.

Mr. **BORLAND.** What do you want the $300,000 for?

Col. **DILLARD.** These barbette carriages have not yet been completed and we estimate we may require $100,000 to complete those carriages. We think we ought to have a working balance of about $200,000. There is no definite item to cover the expenditure of that sum.

Mr. **BORLAND.** What did you originally get that deficiency appropriation for?

Col. **DILLARD.** That was gotten for railway artillery. * * *

The war interfered with the project, and there is not any reasonable expectation of our being able to procure material for this purpose at the present time, and presumably at the end of this war we will have a good deal of railway artillery, and some of it may be available to be allotted down there.

Mr. **Good**. Did you get any of it?

Col. **Dillard**. No, sir. * * *

Mr. **Borland**. Are you not a little liberal in holding back $300,000 to finish those barbette carriages?

Col. **Dillard**. It will not be entirely needed for that purpose, but also for anything else that may come up.

Mr. **Borland**. You are really estimating $100,000 for that purpose and $200,000 as a contingent fund?

Col. **Dillard**. Yes, sir; that is what it amounts to. We should have something under this appropriation because in time of war we may have to buy something quick and that is really the reason we want the money.

AMMUNITION FOR SEACOST CANNON AND LAND DEFENSE CANNON, PANAMA CANAL.

Mr. **Borland**. "For the purchase, manufacture, and test of ammunition for seacoast and land-defense cannon, including the necessary experiments in connection therewith."

You had in the act of 1918 $1,985,000 and in the deficiency act $1,415,000. What is the state of your balances under this appropriation?

Col. **Shinkle**. Mr. Chairman, in addition to that, the 1917 urgent deficiency carried a contract authorization of $700,000. The Treasury balance on the general account is $900,847.23 as of May 10. Under the act of June 6, 1917, the Treasury balance is $497,787.50, the total balance under the two appropriations being $1,398,634.73. There is, however, due on contracts under the general account $837,523.42. The total due on contracts is, therefore, $1,331,718.08. The total unallotted balance is the difference between those two sums, or $66,916.65, of which $63,323.81 is under the general appropriation and $3,592.84 is under the act of June 15, 1917.

Mr. **Borland**. How about your contract authorization? Have you used that up?

Col. **Shinkle**. The total amount of the contract authorization of $700,000 has been allotted. That was under the act of June 15, 1917. We are going to ask you to-day to appropriate money to cover that.

Mr. **Good**. That is not included in the $1,331,000 of contract authorization?

Col. SHINKLE. That is in addition to the $1,331,000, naking slightly over $2,000,000 as the total. The total unallotted, therefore, under all these appropriations for this purpose, for armament of fortifications of the Panama Canal, is $66,916.65.

Mr. BORLAND. How does it happen that you spent so much money for ammunition when you did not go ahead with your program for guns?

Col. SHINKLE. This is the balance of the ammunition to complete the Board of Review's approved program, not only for Panama but the United States and the Insular Possessions, and of this appropriation the sundry civil bill bore its proper proportion, that proportion being the same that the proportion of the armament there bears to the other armament and ammunition.

Mr. BORLAND. You mean that this appropriation bears its proportionate part of the expense of the whole amount of ammunition that you buy to fill the Board of Review's program?

Col. SHINKLE. Yes, sir.

Mr. BORLAND. Did Panama get its share of that program?

Col. SHINKLE. A good part of that ammunition has not yet been delivered. As I stated to this committee, in connection with armament of fortifications, we are not pressing the manufacture of armor-piercing shell, although the orders are placed and it is under production, and that is for the reason that where there has been interference in any way between the program for Coast Artillery ammunition and ammunition for the field army, the latter has been given the right of way, or priority. * * * We are not asking for any additional funds this year, except a small amount, or a relatively small amount, $120,000, for fuses.

Mr. GOOD. You are asking for $838,000.

Col. SHINKLE. I ask permission to amend that. We are now asking for $820,000 cash appropriation, of which $700,000 is to cover contract authorizations, all of which have been allotted; and $120,000 is to provide new fuses to replace fuses in service that are considered unserviceable. I explained to the subcommittee on fortifications the necessity for the replacement of those fuses. The $120,000 asked for fuses here is estimated on the same basis of cost per fuse as the other cash that we asked for before the subcommittee on fortifications. The total that we are asking for now is $820,000.

Mr. **Borland**. How much of that $820,000 do you need in cash?

Col. **Shinkle**. We will need $120,000 in cash, and of the $700,000 we will need the same proportion as we required under the fortification bill of the contract authorizations, because those three appropriations——

Mr. **Borland** (interposing). That was about one-fourth, as I recall it.

Col. **Shinkle**. It was one-half according to my recollection. Of the total contract authorization of $6,000,000, we have asked you to appropriate $3,000,000.

Mr. **Borland**. That is correct.

Col. **Shinkle**. I therefore make the same estimate on this, and will ask $120,000 for fuses, plus $350,000, or one-half, of contract authorizations, making a total of $470,000 in cash, carrying forward the remaining $350,000 as a contract authorization to be covered later. That is based merely on an estimate of the quantity of these shell that will be delivered during the next year, and it can not be said to be accurate.

Saturday, June 1, 1918.

STATEMENT OF COL. J. B. DILLARD, ORDNANCE DEPARTMENT.

ALTERATION AND MAINTENANCE, SEACOAST ARTILLERY, PANAMA CANAL.

(See p. 527.)

Mr. **Borland**. The next item is "For the alteration, maintenance, and installation of the seacoast artillery, including the purchase and manufacture of machinery, tools, and materials necessary for the work, and expenses of civilian mechanics, and extra-duty pay of enlisted men engaged thereon, $230,000." The appropriation under this item for 1918 was $335,000 and you had a deficiency appropriation of $665,000, making a total of $1,000,000.

Col. **Dillard**. Yes, sir.

Mr. **Borland**. What is the status of this appropriation?

Col. **Dillard**. The Treasury balance is $812,171.33; there are due on contracts $40,063.93, and there is an unallotted balance of $772,107.40.

Mr. **Borland**. What do you expect to do, if anything, with the $772,107.40?

Col. **Dillard**. We would like to keep $300,000 of that for use in the next fiscal year, the remainder to be revoked. We spent last year, or rather will have spent this fiscal year, approximately $228,000.

Mr. **Borland**. What is the purpose of getting that money, or what did you intend to do with it?

Col. **Dillard**. It was intended to cover any extraordinary war expenditure. That is to say, if any carriage should be damaged or blown up down there, or damaged in any other way, the carriage would have to be repaired at once, and we would have to have money on hand to spend for it. It is really a war contingency fund. That is what it is needed for.

Mr. BORLAND. What do you say now as to your estimate of $230,000 for 1919?

Col. DILLARD. That may be omitted. I thought it was scratched out. It should have been.

Mr. BORLAND. You are going to use up the balance of $40,000 due on contracts, of course?

Col. DILLARD. Yes, sir. We would like to have, in addition, $300,000.

Mr. BORLAND. The $300,000 will carry you through next year?

Col. DILLARD. Yes, sir.

Mr. BORLAND. That will run you pretty well, will it not, according to the previous expenditures under that head, as your expenditure in 1917 was $97,968.81?

Col. DILLARD. Yes, sir. We were always short on that item; that is to say, the maintenance has always held down below what we consider the necessary amount. In 1918 we will spend about $228,000.

Mr. BORLAND. What is the cause of that?

Col. DILLARD. There were some necessary alterations in the 14-inch carriages down there.

Mr. BORLAND. Special alterations?

Col. DILLARD. Yes, sir.

Mr. BORLAND. What was the nature of them?

Col. DILLARD. The carriages did not stand up in service as well as they should have, and there were some necessary alterations.

Mr. BORLAND. Were they disappearing carriages or barbette carriages?

Col. DILLARD. They are disappearing carriages. The principal item of expense was necessary for increasing the elevation of the guns to give an increased range.

Mr. BORLAND. You increased the elevation how much?

Col. DILLARD. Three degrees, from 12 to 15.

Mr. BORLAND. Did that have any effect on the carriages?

Col. DILLARD. It increased the stress on the carriages. It also considerably complicated the elevating gear and the parts at the lower end of the elevating arm when we did that. There are 10 of those carriages, and the present estimates are based on the cost of $17,500 per carriage.

Mr. BORLAND. You will not retain the disappearing feature?

Col. DILLARD. Yes, sir; we will have to.

Mr. BORLAND. I notice that you are putting those new batteries upon barbette carriages.

Col. DILLARD. Those are 12-inch carriages.

Mr. BORLAND. Is that the cause of this change, or did you change to the barbette carriages for the reason you have stated?

Col. DILLARD. I do not know why it was decided to have those guns on barbette carriages, except that for long-range firing the disappearing carriage loses a good deal of its value, because the enemy can not see it whether it is a barbette or a disappearing carriage——

Mr. BORLAND (interposing). So, there is a range at which the disappearing feature ceases to be of value?

Col. DILLARD. It depends, not only upon the range, but it depends upon the location of the guns. I think that 30° elevation is about the maximum elevation at which a gun should be mounted on a disappearing carriage.

Mr. Borland. Because the greater the elevation, the greater would be the downward pull?

Col. Dillard. Yes, sir.

Mr. Borland. As a matter of fact, the long-range shell describes a high parabola, and will drop down on or inside of the fortification, if it hits at all, and therefore the disappearing feature does not have much value?

Col. Dillard. That is one idea of it; yes, sir.

Mr. Borland. It is just as liable to drop into the disappearing pit as into any other kind of pit?

Col. Dillard. Yes, sir.

Mr. Borland. Are these disappearing carriages more expensive to maintain than the barbette carriages? There is considerably more mechanism connected with them, is there not?

Col. Dillard. I think somewhat more perhaps, but I do not think there would be any material difference.

Mr. Borland. While you have the extraordinary expense of changing those guns to 15° elevation, and then of changing the disappearing carriages to barbette carriages, you got all of that done within that amount of $228,000?

Col. Dillard. Yes, sir.

Mr. Borland. You do not expect to do that again?

Col. Dillard. No, sir.

Mr. Borland. So, this item ought to go back pretty nearly to normal, ought it not?

Col. Dillard. Yes, sir; but, in the first place, $68,000 is really not sufficient, especially in time of war, when it is necessary for us to have some money on hand. There is no telling what might happen.

Mr. Borland. You estimate that you will need a contingent fund on hand, but we are now trying to arrive at what would be the normal condition. You will have more guns down there, will you not?

Col. Dillard. Yes, sir; we have. We have more than we had last year. * * * The $300,000 is really to meet unforeseen conditions and that is the reason we want to have it.

Mr. Byrns. I understood you to say something about the carriages not standing up and requiring a good deal of expense for changing. I did not exactly understand the reason for their not standing up.

Col. Dillard. The carriage passed all the tests very satisfactorily. The carriages at Panama developed weak elevating screws. Why the elevating screw of the first carriage did not break and why those at Panama, in three or four cases, did break, I do not know. I think it possible that some of them had some poor material in them, but the design right in there was not as good as it might have been.

Mr. Byrns. Is that true as to all of them?

Col. Dillard. We have rectified that.

Mr. Byrns. Was that due to failure to test them properly?

Col. Dillard. No, sir.

Mr. Byrns. Or was it due to poor construction?

Col. Dillard. No, sir; the carriage was put through the regular test, the same as any other carriage. In fact, the test was a very severe one. That is the kind of thing that is liable to arise in any design occasionally.

PER DIEM IN LIEU OF SUBSISTENCE.

Mr. BORLAND. Colonel, you have some new language here. You provide that "Where the expenses of persons engaged in field work or traveling on official business are chargeable to appropriations herein for fortifications or other works of defense for the Panama Canal, a per diem rate of $4 may be allowed in lieu of subsistence," etc. My recollection is that in other parts of the bill the provision is for not exceeding $4 per day, but this provides for a per diem of $4. As I understand it, that item can be stricken out, because there is a provision on that subject, is there not?

Col. DILLARD. Yes, sir.

Mr. BORLAND. There is a provision that limits you to not exceeding $4 per day?

Col. DILLARD. Yes, sir.

PRINTING AND BINDING.

Mr. BORLAND. What have you to say in regard to this provision for printing and binding?

Col. DILLARD. There has been very considerable delay in securing work down at the Government Printing Office. That delay has been from six weeks to two months. This provision is put in the Army bill. We have to wait from six weeks to two months to get publications through, and that has been embarrassing at times when troops ought to be furnished with necessary descriptive matter of articles that they are using. We should have the authority given by this clause.

ALTERATION AND MAINTENANCE OF SEACOAST ARTILLERY, PANAMA.

(See p. 524.)

Mr. GOOD. Where were those two carriages that fell down tested?

Col. DILLARD. The test was made at the proving ground at Sandy Hock.

Mr. GOOD. The carriage itself was not tested until it was emplaced?

Col. DILLARD. No carriages are. You test one carriage, but you do not test the second, third, or fourth carriage until they go into the emplacements.

Mr. GOOD. Would those two that did not come up to the requirements——

Col. DILLARD (interposing). There were three or four.

Mr. GOOD. Were they constructed on the same plan and specification as the first one that stood the test?

Col. DILLARD. Yes, sir.

Mr. GOOD. Then, why did these carriages not stand the test, if the first one stood the test, and if these were duplicates?

Col. DILLARD. I can not tell you exactly why. I have been puzzled about that myself for the last two years. I think possibly the elevating screws had a poor piece of steel in them.

Mr. GOOD. Where were they manufactured?

Col. DILLARD. At the Watertown Arsenal. We changed the steel in the elevating screws. As a matter of fact, most of that money was spent for the alteration of the carriages to get a higher elevation.

Probably of that $17,000 per carriage only about $1,000 per carriage went into the change of the elevating screw, or into what we had to do on account of the weakness developed.

Mr. GOOD. They have been corrected?

Col. DILLARD. Yes, sir.

Mr. GOOD. So that they meet the specifications and stand the test?

Col. DILLARD. Yes, sir. It did not amount to as much as it sounds like when you talk about it.

MONDAY, JUNE 3, 1918.

ORDNANCE DEPOT, PANAMA CANAL.

STATEMENT OF COL. S. E. BLUNT, UNITED STATES ARMY, RETIRED, OFFICE OF THE CHIEF OF ORDNANCE.

Mr. BORLAND. Colonel, your position is what?

Col. BLUNT. I am on duty in the office of the Chief of Ordnance I am a colonel in the United States Army, retired.

Mr. BORLAND. What are your particular duties?

Col. BLUNT. I was an officer in the Ordnance Department for some 40 years, and then I was retired in 1912. My detail duty is what is called supervisor of arsenals, and I have charge of the manufacturing operations of the arsenals for the Chief of Ordnance.

Mr. BORLAND. The committee has before it the estimates for the ordnance depot at Panama. Do they come within your jurisdiction?

Col. BLUNT. Yes, sir.

Mr. BORLAND. Appropriations were made last year amounting to $86,500 in the regular bill and $8,400 in a deficiency act. Will you please advise the committee what is the state of these appropriations how much has been expended, how much money you have on hand, and what has been accomplished?

Col. BLUNT. The ordnance depot was established about 18 months or two years ago, and with that money allotted three large and one small storehouse, five magazines, a shop building, barracks and officers' quarters for the commanding officer and assistant officer, noncommissioned officers and civilian employees, and various repair shops have been constructed. The stores are issued to the troops serving on the Canal Zone, and such repairs as can possibly be accomplished in what you might call not exactly in a field shop, but in a small shop, are repaired in the ordnance depot. Small arms are repaired and articles of soldiers' equipment are repaired there.

Mr. BORLAND. Do you attempt any repairs of Field Artillery there?

Col. BLUNT. No, sir, hardly that. We would do those repairs there if they could possibly be done. We do small repairs that can be done in that shop.

Mr. BORLAND. What is the nature of the machine shop they have there?

Col. BLUNT. It is equipped with the ordinary lathes, drill presses, machine tools, and equipment of that nature for making repairs.

Mr. BORLAND. Do you have a forge there?

Col. BLUNT. No, sir; no forging shop. There is a small forge there

Ir. Borland. Do you have portable forges?

ol. Blunt. Yes, sir; but no large forge.

Ir. Borland. Do you have any welding machinery or equipment?

ol. Blunt. I think not.

Ir. Borland. How much of that appropriation have you on hand?

ol. Blunt. Practically very little of it. Most of the work has completed or obligated, and the work is going on.

Ir. Borland. Now, you are asking for $72,000 for certain addi- to the ordnance depot?

DRAWAL OF ESTIMATES FOR ROADS, WALKS, ETC.—FILLING AND GRADING.

l. Blunt. Those estimates were submitted some eight or ten hs ago, and the Acting Chief of Ordnance, who was Gen. Wheeler, the matter was under consideration at that time, directed me I appeared before the committee to withdraw the two principal there, namely, the item of $35,000 for roads, walks, sewers, , light and power, sanitary work, and mosquito prevention, and f $12,500 for filling and grading and extending the main sewer. would leave items we still desire to ask of the committee amount- $24,500. In other words, I was directed to withdraw the first there of $35,000, and I was also directed to withdraw the next last item of $12,500 for filling and grading and extending the sewer. I have since presented the matter to Gen. Williams, told me to follow the instructions which I previously received. er words, he told me to obey Gen. Wheeler's direction and to raw them now.

Borland. And you are ready to withdraw them now?

Blunt. Yes, sir; to withdraw the item of $35,000 and the f $12,500 to which I have referred, leaving only the items ting to $24,500.

FIRE-PROTECTION FACILITIES.

Borland. That sum of $24,500 embraces an item of $3,000 ilities for fire protection.

Blunt. Yes, sir. The purpose of that is to install an auto- sprinkler system in the woodworking and saddlery shop and storehouse, and a fire-alarm system, and to get some fire hose osecarts for the outside work.

TELEPHONE SYSTEM.

r. Borland. The next is $2,500 for a telephone system.

l. Blunt. There is no telephone system at present from the building to the different shops or storehouses, and it is desired t in an intercommunicating system, so that loss of time in com- icating between those different places would not occur. There- they want to put in a 16-station intercommunicating telephone em, and then they want to connect that with the long distance em of the Isthmus, so that they will be able to connect up where.

PAINTING BUILDINGS.

Mr. **Borland**. The next item is $7,000 for painting buildings to reduce their visibility.

Col. **Blunt**. The roofs of the depot buildings are red tile or asphalt or slate shingles. The buildings are concrete, and the walls are white. The consequence is that the depot is glaringly visible, both on land and from the air. All the other buildings on the Isthmus have been painted a darkish green to secure invisibility, and it is desired to paint the depot buildings in the same way.

FENCE AROUND DEPOT RESERVATION.

Mr. **Borland**. The next item is for a fence surrounding the depot reservation, $9,000.

Col. **Blunt**. The depot reservation is immediately adjacent to the post of Corrozal, and it is not far from the main railroad line and the main wagon road. The result is that animals from the adjacent post wander right in. The purpose also is to keep strangers out. The magazines and storehouses are not properly guarded, and it is the desire to have a fence surrounding the depot. It will be an ordinary wire fence, with concrete posts and barbed wire at the top so as to prevent freedom of access to the grounds.

Mr. **Borland**. How many yards of fence is it proposed to build?

Col. **Blunt**. I am sorry I can not tell you that.

Mr. **Borland**. $9,000 would mean a good deal of fence, would it not?

Col. **Blunt**. Yes, sir. They want to make it a permanent fence.

Mr. **Byrns**. What is the size of the reservation?

Col. **Blunt**. I do not know. I have never been down there.

Mr. **Borland**. It might be a wall that they propose to construct with this $9,000.

Col. **Blunt**. I hardly think that. They want to make a permanent fence, with concrete posts. It is to be about 7 feet high, constructed of the ordinary square mesh wire.

Mr. **Slemp**. That wire is very expensive now.

Col. **Blunt**. Yes, sir. Then, on top of the fence it is proposed to have three strands of barbed wire. The fence is to be finished so as to turn outward, and the three strands of barbed wire would make what is known as an unclimbable fence.

ADDITIONAL OFFICE BUILDING.

Mr. **Borland**. The next item is, "For additional for an office building, $3,000." How much have you had heretofore for that purpose?

Col. **Blunt**. We had $4,000 for an office building. I think that undoubtedly a mistake was made in the original estimate of $4,000. I suppose, also, that the expense of everything has very greatly increased. They want to make a necessary addition, and ask therefor the sum of $3,000. The business of the department or depot has increased since it was constructed, and the garrison of the Isthmus has been increased. There is a greater amount of work required in making the issues from the storehouses, and the repairs have also been greater.

WEDNESDAY, JUNE 5, 1918.

SUBMARINE BASE AND AVIATION FIELD, COCO SOLO POINT, PANAMA CANAL.

(See pp. 495, 499.)

STATEMENT OF CIVIL ENGINEER KIRBY SMITH, UNITED STATES NAVY, BUREAU OF YARDS AND DOCKS, NAVY DEPARTMENT.

Mr. BORLAND. The first item that we want to have you enlighten the committee upon is that of the submarine base at Coco Solo Point, which was appropriated for in the last sundry civil bill. I might explain to you that the items relating to the defenses at Panama were formerly carried in the sundry civil bill, but they have now been transferred to the fortification bill, which is the bill under consideration. This item is for $750,000, and the committee would like to have you advise them what has been done under that appropriation and what is the present state of your balance?

Capt. SMITH. As you have just stated, that appropriation heretofore has been carried in the sundry civil bill. It has been made directly to the Army and has been expended by the canal authorities. That appropriation has not been under the cognizance of the Bureau of Yards and Docks or of the Navy Department.

Mr. BORLAND. The committee was advised in the hearings that some one from the Navy could produce the information, and that it was on information from the Navy that the appropriation was made.

Capt. SMITH. I have here the plan of the submarine base as it exists now. It consists, as you see, of a basin with a channel dredged and four piers. It has officers' quarters, aviators' quarters, a dispensary, barracks for the men, and miscellaneous items, with a railroad connection. Then, immediately adjacent to that, and virtually forming a part of the scheme, is this aviation field [indicating].

Mr. BORLAND. That item was $250,000.

Capt. SMITH. Yes, sir.

Mr. BORLAND. And this [indicating] is a part of one general improvement?

Capt. SMITH. It is apart of one general improvement. I have a report of the present status of these different projects that are shown here on the plans, and I can have it tabulated for you. On this plan are indicated the dates upon which these different projects can be expected to be completed. I can prepare and insert in the record a table giving that information more concisely.

Mr. BORLAND. We would be glad if you would do so.

Capt. SMITH. I will furnish that for the record.

Mr. BORLAND. What you call finger piers here [indicating] are slips into which submarines can go?

Capt. SMITH. Yes, sir.

Mr. BORLAND. As I understand it, these will be ready in about four months?

Capt. SMITH. I think so, but I will insert that data with the other.

Mr. BORLAND. The rest of the data refers to the buildings?

Capt. SMITH. Yes, sir; to the barracks and quarters, etc.

Mr. BORLAND. What relation does this aviation field bear to the coast defenses? Is it attached to the coast defenses or to the submarine base?

Capt. SMITH. My impression only on that is that it is attached and is operated in conjunction with the coast defenses. Both the aviation project and the submarine base have been considered as one general project.

Mr. BORLAND. Is it under the jurisdiction of the Army or Navy, or of the governor of the Canal Zone?

Capt. SMITH. They are now being operated under the jurisdiction of the Navy, and a naval officer is in charge of the station. That, I think, is also true of the submarine base, but the actual construction work was accomplished by the Canal Commission.

Mr. BORLAND. Do you know anything about the project to locate four permanent coastal aviation stations at Panama?

Capt. SMITH. I do not.

Mr. BORLAND. One at Coco Solo Point and one at some other place on the Atlantic coast, and one at Balboa dump, and one at some other point on the Pacific coast.

Capt. SMITH. I know nothing about that.

Mr. BORLAND. You are connected with the Bureau of Yards and Docks?

Capt. SMITH. Yes, sir.

Mr. BORLAND. Whose duty it was to construct this aviation station and submarine station?

Capt. SMITH. Yes, sir.

Mr. BORLAND. It has not yet reached the point where you have turned it over for operation by the military or naval authorities?

Capt. SMITH. Yes, sir; we now have on the station 10 officers and 173 naval men.

Mr. BORLAND. And that jurisdiction is now under the Navy Department?

Capt. SMITH. Yes, sir; the control of those men is now in the Navy Department.

Mr. BORLAND. Is it proposed to turn them over at any time to the control of the Army or the governor of the zone?

Capt. SMITH. I am not informed definitely as to that, but not to my knowledge, and certainly it would be contrary to any policy that I have ever heard enunciated.

Mr. BORLAND. The committee would like to know, in view of the fact that estimates are now before the committee for the construction of four coastal aviation stations at Panama, whether those four stations are additional to and separate from this one you are describing?

Capt. SMITH. They are; yes, sir.

Mr. BORLAND. And, in addition to that, we would like to know whether this particular aviation station you are describing is so attached to the submarine and naval service that it is not available for the coast defense. My understanding of your answer is that it is available for the coast defense.

Capt. SMITH. That certainly is my impression, and I speak from almost certain knowledge on that point. But that, as I say, is a question of policy on which I am not qualified to speak.

Mr. BORLAND. You will furnish the committee a statement showing the stages of construction and the dates on which it is expected that these projects will be completed.

Capt. SMITH. I will prepare that statement for you.

The following is a list of buildings at the aviation field and submarine base, Coco Solo, with dates of completion of each:

Base commander's quarters (estimated date)	May 1, 1918
Junior officers' quarters, 3 buildings	Apr. 1, 1918
Aviation officers' quarters (estimated date)	Do.
Aviation barracks, 160 men	June 1, 1918
Barracks for 180 men	Do.
Barracks for 140 men, mess hall, excepting cold storage	Apr. 30, 1918
Barracks for 280 men	Apr. 15, 1918
Paymaster storehouse	Do.
Oil-storage buildings (estimated date)	May 1, 1918
Dispensary	May 30, 1918
General office	Apr. 15, 1918
Laundry and boiler house (estimated date)	May 1, 1918
Torpedo storage and ordnance workshop	May 15, 1918
Storage-battery shop	June 1, 1918
Four individual stores (estimated date)	May 1, 1918
Boathouse	Oct. 1, 1918
Power house and machine shop	Do.
Dirigible hangar	July 1, 1918
Hydrogen generator shed	June 1, 1918
Seaplane hangar	July 1, 1918
The Submarine Finger Piers will be completed	Oct. 1, 1918

The following buildings are now ready to be sent out for bids and will be completed August 15, 1918: 2 blower houses, compressor house and laboratory, dirigible storehouse, and gas holder.

LETTER RELATIVE TO NITRATE PLANTS.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, June 11, 1918.

Hon. W. P. BORLAND,
House of Representatives.

MY DEAR MR. BORLAND: In accordance with your request of June 6, I have had the Congressional Record of April 4, 1918, carefully examined.

It seems that the debate under the provisions of House resolution No. 278, printed on pages 4951-4981, was based upon rather incomplete knowledge and somewhat partial statements, and I shall therefore state the entire matter at such length as may be necessary to permit a clear understanding, not only of the merits of Dam No. 2 of the Muscle Shoals project considered as a source of hydroelectric energy, but also of the general policy of the United States with reference to the fixation of atmospheric nitrogen, since the latter subject is deeply involved in the consideration of the former and its explanation should take precedence.

Section 124 of the national defense act of 1916 contained the following provision:

"The President of the United States is hereby authorized and empowered to make, or cause to be made, such investigation as in his judgment is necessary to determine the best, cheapest, and most available means for the production of nitrates and other products for munitions of war and useful in the manufacture of fertilizers and other useful products by water power or any other power as in his judgment is the best and cheapest to use; and is also hereby authorized and empowered to designate for the exclusive use of the United States, if in his judgment such means is best and cheapest, such site or sites, upon any navigable or nonnavigable river or rivers or upon the public lands, as in his opinion will be necessary for carrying out the purposes of this act; and is further authorized to construct, maintain, and operate, at or on any site or sites so designated, dams, locks, improvements to navigation, power houses, and other plants and equipment or other means than water power as in his judgment is the best and cheapest, necessary or convenient for the generation of electrical or other power and for the production of nitrates or other products needed for munitions of war and useful in the manufacture of fertilizers and other useful products.

"The President is authorized to lease, purchase, or acquire, by condemnation, gift, grant, or devise, such lands and rights of way as may be necessary for the construction and operation of such plants, and to take from any lands of the United States, or to purchase or acquire by condemnation materials, minerals, and processes, patented or otherwise, necessary for the construction and operation of such plants and for the manufacture of such products.

"The products of such plants shall be used by the President for military and naval purposes to the extent that he may deem necessary, and any surplus which he shall determine is not required shall be sold and disposed of by him under such regulations as he may prescribe.

"The President is hereby authorized and empowered to employ such officers, agents, or agencies as may in his discretion be necessary to enable him to carry out the purposes herein specified, and to authorize and require such officers, agents, or agencies to perform any and all of the duties imposed upon him by the provisions hereof.

"The sum of $20,000,000 is hereby appropriated, out of any moneys in the Treasury not otherwise appropriated, available until expended, to enable the President of the United States to carry out the purposes herein provided for.

"The plant or plants provided for under this act shall be constructed and operated solely by the Government and not in conjunction with any other industry or enterprise carried on by private capital."

In consequence of this provision arrangements were promptly made by the Chief of Ordnance to have Dr. C. L. Parsons, Chief Chemist of the Bureau of Mines, an eminent and disinterested American expert in nitrogen fixation, visit all establishments in Europe engaged in nitrogen fixation to which access was permitted by the governments concerned, this for the purpose of gaining information as to the most recent developments in the art. Dr. Parsons was successful in securing admission to plants using one, or another, of the three principal processes, the arc, the cyanamide, and the Haber, and on his return submitted to the Chief of Ordnance a report giving valuable details not previously known or available. A further report was secured from Mr. Eysten Berg, a Norwegian expert on the subject.

Thereafter the President directed the formation of a board consisting of the Secretary of War, the Secretary of the Interior, and the Secretary of Agriculture, for the purpose of considering the relative advantages of various localities at which the establishment of nitrogen fixation plants had been suggested, and of advising him as to the most favorable locality for the purpose and the process of fixation deemed most desirable for adoption.

This board, accompanied by officials of the three executive departments concerned, visited Columbia, S. C.; Atlanta, Ga.; Birmingham and Florence, Ala.; Nashville, Tenn.; Louisville, Ky.; and Wheeling, W. Va. Owing to the declaration of war with Germany, it became impossible to visit localities in the Mississippi Valley and in the western part of the country, the advantages of which would otherwise have been investigated.

Upon the return of the board from its inspection, a committee of scientists and engineers was formed at the instance of the Secretary of War to review the accumulated facts and to advise him as to the process whose adoption offered the prospect of largest benefits to the United States. In the meantime, three representatives of the board had visited the plant for the Haber process belonging to the General Chemical Co. at Long Island City, N. Y., and that of the American Cyanamid Co. at Niagara Falls, Ontario, and were able to lay before the committee of experts data regarding the two processes of fixing nitrogen there employed. The process developed by the General Chemical Co., a modified Haber process, in which nitrogen and hydrogen, mixed in the proportions of one volume of nitrogen to three of hydrogen, are combined into ammonia under high pressure, about 80 atmosphere, or 1,200 pounds to the square inch, seemed to offer the greatest possibility of economy and general usefulness, and it was recommended by the committee that this process be selected and that a reasonable sum, between $3,000,000 and $4,000,000, be allotted from the appropriation of section 124 of the national defense act with which to buy, install, and operate the apparatus required.

This recommendation was accepted by the board of three Secretaries and approved by the President, and the site was fixed at Sheffield, Ala., which is about 3 miles below the foot of Muscle Shoals on the Tennessee River. Being largely experimental, the plant for using the process of the General Chemical Co., the so-called nitrate plant No. 1, was, by deliberate design, planned for an output of ammonium nitrate, constituting only a small fraction of the war requirements of the United States, the intention being to enlarge it progressively as experience warrants. The construction of this plant was begun in July, 1917, and it is understood that the output originally proposed has been doubled and the final cost will be about $11,500,000, of which $6,520,000 has already been set aside from the $20,000,000 appropriation of the national defense act of 1916. Any balance must be defrayed from some other fund, because the remainder of the above appropriation of $20,000,000 has since then been allotted by the President for the construction of Dam No. 2 of the Muscle Shoals project.

After the construction of the above plant had been begun it became evident to the Ordnance Department that large additional provision must be made for assuring our supply of fixed nitrogen, which as nitric acid, or ammonia, enters into the manufacture of trinitrotoluol, nitrocellulose, smokeless powder, ammonium nitrate, and picric acid, all of which are used for military purposes. At present the supply of nitric acid is secured solely from Chilean saltpeter, or sodium nitrate, and our principal source of ammonia is the by-product of the coke industry, although considerable is also derived from the gas industry. Reliance on saltpeter for our nitric acid is obviously dangerous and the possibility of increasing by-product and gas ovens and, correspondingly, their output of ammonia is necessarily limited. The most available method of increasing our available supply of fixed nitrogen was obviously, therefore, to install additional plants for fixing atmospheric nitrogen. The only process which, up to this time, has been operated in America upon a large commercial basis is the cyanamid process, and for this reason it appears to have been decided to adopt this process for such plants as are required by our war policy and must be constructed now and in the immediate future.

The first of the plants employing the cyanamid process, so-called nitrate plant No. 2, is being constructed on the south bank of the Tennessee River, near Muscle Shoals. Nitrate plant No. 3 has been divided into two sections, one of which is to be located at Cincinnati and the other at Toledo. So far as is known, no other nitrate plants are at present in contemplation by the Army, but it is unofficially stated that the Navy is also considering the establishment of a nitrate plant of some sort, details of which are not at present obtainable.

The capacity of nitrate plant No. 2 at Muscle Shoals as given by the Ordnance Department is 110,000 tons of ammonium nitrate annually, for the manufacture of which there will be installed a power plant of 120,000 horsepower, of which 80,000 horsepower will be steam, located immediately at Muscle Shoals and the remainder will be transmitted power, part steam, part hydroelectric, from the lines of the Alabama Power Co.

In November, 1917, the President decided to proceed with the construction of Dam No. 2 of the Muscle Shoals project, which is described in House Document No. 1262, Sixty-fourth Congress, first session.

As proposed in that document, the plan for the development of the power available at Muscle Shoals comprehends the construction of one navigation dam and lock immediately above Florence, this dam being known as Dam No. 1, and of two power dams, numbered, proceeding upstream, respectively, 2 and 3, with corresponding navigation locks and appropriate power houses; Dam No. 2, with a fall of about 95 feet, being about 3 miles above Dam No. 1, and Dam No. 3, with a fall of about 40 feet, being about 15 miles above Dam No. 2. As above stated, Dam No. 2 alone is to be built at present, the estimated cost of all the work, including power house and necessary machinery, being about $14,500,000. Without making any attempt at a close analysis of power available, it is figured that a comparatively small use of auxiliary steam power would increase the primary continuous power at Dam No. 2 from about 65,000 horsepower to over 150,000 horsepower, thereby making the cost of per annual horsepower of the proposed installation not much in excess of $100, which is a reasonable figure.

As stated above, because no other form of power is at present available, it has been found necessary to use steam power in nitrate plant No. 2, which is close to the south end of Dam No. 2. Obviously this steam plant can be used to transform in part, or in whole, the secondary power of Dam No. 2 into primary continuous power, which will be of great value especially in electrochemical industries (such as the manufacture of ferrosilicon), which require a dependable continuous power for their economical operation.

In these industries the cost of power is an important part of the cost of the final product and, as a rule, the costs of labor and raw materials are not as important as in ordinary manufacturing operations, in which the cost of power has been found to average only 1½ per cent of the cost of the final product. For example, it has been found that one horsepower of energy employed continuously throughout an entire year, a so-called annual horsepower is needed to produce about one and one-fifth tons of 50 per cent ferrosilicon. The cost of an annual horsepower, if delivered under the conditions that will exist at Muscle Shoals, should not exceed about $20, while in normal times the market price of the corresponding product would be about $100, thus showing that the cost of the power is about 20 per cent of the market price of the final product. Were this power generated exclusively by steam, its cost would be from 60 to 100 per cent greater than that of water power, so that, obviously, the use of steam power in the electrochemical industry is not ordinarily advantageous in competition with hydroelectric power.

This is the basis of the statement made to you at our interview the other day that the construction of Dam No. 2 will help to protect the investment of the United States in nitrate plant No. 2 by rendering the United States more or less independent of the holders of the patents of the cyanamid process. The point is that the furnaces used in making calcium carbide, which is the first step in the cyanamid process, may, with slight additional expense, probably be used in making ferrosilicon, or, in any event, the expense of installing new furnaces peculiarly adapted to the manufacture of ferrosilicon would not be very great. It results, therefore, that persons interested in the ferrosilicon industry, which in this country is a growing one, would be able to enter into competition for the purchase of nitrate plant No. 2, should this come upon the market, or the Government could itself manufacture cyanamid, ferrosilicon, or calcium carbide, using for the purpose all, or a large part, of the relatively cheap hydroelectric power generated at Dam No. 2, whereas should cheap power not become available, nitrate plant No. 2 operating with steam power would probably be unattractive to private individuals and should the Government be inclined to dispose of it, in all likelihood its sale value would be relatively low. The ivestment of the United States in nitrate plant No. 2 is understood to be in the neighborhood of $36,000,000. and while a great deal of this amount might justly be charged off as a war expenditure. it nevertheless appears to be good business policy to develop the water power of Dam No. 2 and thereby to create a reasonable probability, first, that if the manufacture of nitrates, either for explosives or for fertilizer, is to be continued it can be done at low power cost, and this, as above explained, is one of the principal items in the final cost, and, second, that should the Government decide to dispose of the plant at the conclusion of the war, it will be in a position to invite the interest of others than the American Cyanamid Co.

Further, if nitrate plant No. 1 is as successful as we anticipate it will be, any power required for its operation and for its enlargement can be supplied very cheaply from Dam No. 2.

For and in the absence of the Chief of Engineers:

Yours, very truly,

C. KELLER,
Brigadier General, Engineers.

Artillery contracts.

Contractor.	Authority to proceed.	Date of order.	Character of plant.	Investment increased facilities.	Value of contract.	Terms and conditions.	Remarks.
The Morgan Engineering Co., Alliance, Ohio, 12-inch mortar carriages, Model 1918.	CS105: Dec. 8, 1917.... CS105A: Dec. 10, 1917.	Dec. 8, 1917 Dec. 10, 1917	Heavy machinery manufacturers.	$2,900,000.00	$6,006,000.00	Improvements belong to Government; to be removed by United States within 1 year of end of war or to be sold to contractor after this or future contracts have been completed at highest price Government could obtain elsewhere.	This company was experienced in the making of artillery carriages before the war and expansion of their plant thought highly desirable.
The Morgan Engineering Co., Alliance, Ohio, wheeled mounts for 5-inch and 6-inch guns.	CS33: Aug. 23, 1917.... CS33A: Sept. 24, 1917.. CS37: Sept. 28, 1917... CS38: Sept. 28, 1917...	Aug. 23, 1917 Sept. 24, 1917 Sept. 28, 1917 .....do.......	.....do...............	85,000.00	2,506,490.00	Improvements belong to Government.	Do.
Harrisburg Manufacturing & Boiler Co., Harrisburg, Pa., 8-inch barbette carriages.	CS101: Dec. 6, 1917.... CS63: Oct. 11, 1917....	Dec. 6, 1917 Oct. 11, 1917	Machine shop.........	45,000.00	922,974.12	.....do..................	This company was a manufacturer of machine tools, with capacity and ability.
Harrisburg Manufacturing & Boiler Co., Harrisburg, Pa., fabricated material and castings for railway mounts.	CS171, P4247-444C; Mar. 18, 1918.	Mar. 18, 1918	.....do...............	125,000.00	1,883,000.00	Improvements belong to Government; to be removed by United States within 1 year of end of war or to be sold to contractor after this or future contracts have been completed at highest price Government could obtain elsewhere.	Do.
The Marion Steam Shovel Co., Marion, Ohio, gun railway mounts.	CS143: Jan. 3, 1918....	Jan. 3, 1918	Contractors' equipment.	250,000.00	4,870,000.00	.....do..................	This company manufactured large cranes, steam shovels, and steam engines before the war, combining features of car manufacturers and delicate machine work which was an almost impossible combination to secure elsewhere.

Artillery contracts—Continued.

Contractor.	Authority to proceed.	Date of order.	Character of plant.	Investment increased facilities.	Value of contract.	Terms and conditions.	Remarks.
New Britain Machine Co., New Britain, Conn.; assembly of carriages for 3-inch antiaircraft gun.	CA52; Jan. 26, 1918....	Jan. 26, 1918	Automatic machinery.	$375,000.00	$6,153,000.00	Improvements belong to Government to be removed by United States or otherwise disposed of one-half year after last contract as executed with United States Government has been completed.	The contractor was thought to be particularly well fitted to manufacture antiaircraft carriages and has so proved.
New Britain Machine Co., New Britain, Conn., trailer carriages for 4.7-inch antiaircraft guns.	P7993-688C; May 9, 1918.	May 16, 1918	.....do...............	125,000.00	[1]	Improvements belong to Government. These facilities are machine tools and are being provided for use on a contract which it is believed will be placed with the contractor. In case this contract is not so placed, facilities will be removed and used elsewhere.	
American Car & Foundry Co., Detroit, Mich.	1; June 5, 1917......... 2; June 6, 1917......... 7; June 6, 1918........... 8; June 5, 1917........... 218; Aug. 21, 1917...... 219; Aug. 21, 1917...... 343; Nov. 13, 1917...... 348; Dec. 19, 1917...... 397; Dec. 19, 1917......	June 5, 1917 June 6, 1917 .....do....... June 5, 1917 Aug. 21, 1917 Aug. 21, 1917 Dec. 27, 1917 Dec. 19, 1917 Jan. 2, 1918	Car building plant....	1,050,000.00	70,000,000.00	Fixed-price contracts wherein increased facilities are furnished and owned by the Government and which are retained by the Government after the execution of contract. Government agrees to remove facilities and leave plant in same condition as prior to contract, subject only to reasonable wear and tear. All without expense to contractor.	This company offered to do the work at a time when no one else in the United States cared to undertake it.
Edgewater Steel Co., Edgewater, Penn.	G536-316C; Sept. 19, 1917.	Oct. 21, 1917	Forgings.............	1,850,000.00	2,164,500.00	Cost plus fixed-profit contract. Other conditions same as in American Car & Foundry Co. contract above.	Good organization.

Hepplnstad Forge & Knife Co., Pittsburgh, Pa.	G11C0; Aug. 14, 1917..	Aug. 14, 1917	.....do................	1,130,000.00	2,475,000.00	Fixed-price contract wherein increased facilities are furnished and owned by the Government and which are retained by the Government after the execution of contract.	Organization trained in work.
Bethlehem Steel Co., South Bethlehem, Pa.	GC130; Sept. 1, 1917...	Sept. 1, 1917	Ordnance............	700,000.00	2,101,386.00	.....do....................	Do.
Standard Forgings Co., Indiana Harbor, Ind.	GC123; Sept. 1, 1917.. G817-332C; Nov. 16, 1917. G1423-340C; Jan. 31, 1918. P2371-383C; Feb. 16, 1918.	Sept. 20, 1917 Nov. 16, 1917 Jan. 31, 1918 Feb. 16, 1918	Forging plant........	1,552,300.00	2,411,000.00	Fixed-profit contracts wherein increased facilities are furnished and owned by the Government and which are retained by the Government after the execution of contract. Also about $140,000 worth of material on this contract bought on fixed price, Government to own facilities.	Previous experience on large forgings.
Tacony Ordnance Co., Tacony Pa.	GC100; June 20, 1917... G300-335C; Aug. 2, 1917	Aug. 20, 1917 Nov. 14, 1917	No plant.............	2,399,788.00	1,744,550.00	Fixed-profit contract wherein increased facilities are furnished and owned by the Government and which are retained by the Government after the execution of contract.	New organization.
Mesta Machine Co., Pittsburgh, Pa.	CF420; Dec. 7, 1917.....	Jan. 11, 1918	Forgings.............	600,000.00	1,000,000.00	Fixed price, Government to own plant but contractor to buy it at a predetermined depreciated value, either on installments or by lump sum, at end of contract.	Previous experience of company indicated that organization was capable of handling the work.
Northwestern Ordnance Co., Madison, Wis., finished gun.	GC107; July 19, 1917..	Sept. 25, 1917	Machining and assembling.	1,215,000.00	3,840,050.00	Cost plus fixed profit with allowance for increased facilities which facilities belong to the Government and are owned by Government at end of contract.	Contractor seemed to have organization capable of handling the work.
Bullard Engineering Works (Inc.), Bridgeport, Conn., finishing guns.	G1159-316C——........ P7302-652C; May 4, 1918.	May 6, 1918	.....do................	2,550,000.00	4,781,744.00	.....do....................	Well qualified organization.
Buckeye Steel Castings Co., Columbus, Ohio, gun forgings.	G595 315C; Dec. 1, 1917.	Dec. 1, 1917	Forging plant........	175,000.00	817,700.00	.....do....................	

[1] Not known: estimated at $5,000,000.

Artillery contracts—Continued.

Contractor.	Authority to proceed.	Date of order.	Character of plant.	Investment increased facilities.	Value of contract.	Terms and conditions.	Remarks.
Standard Steel Works Co., Burnham Pa., gun forgings.	G519-332C; Sept. 20, 1917.	Nov. 30, 1917	Forging plant	$1,225,000.00	$2,475,000.00	Cost plus fixed profit with allowance for increased facilities, which facilities belong to the Government and are owned by Government at end of contract.	Previous experience on similar work.
Wisconsin Gun Co., Milwaukee, Wis., finished guns.	GC109; June 29, 1917	Aug. 29, 1917	Finish machining and assembling.	1,030,000.00	2,885,000.00	do	Good organization; willing to accept responsibility.
Symington Anderson Co., Rochester, N. Y., finished guns.	G964-341C; Nov. 23, 1917. GC102; July 27, 1917	Nov. 23, 1917 July 27, 1917	No plant	3,601,348.00	9,045,000.00	do	Good men; willing to accept work.
American Brake Shoe & Foundry Co., Erie, Pa., finish, machine, and assemble guns.	GC113; May 15, 1918	May 15, 1918	Railway supplies	3,050,000.00	10,710,000.00	do	Good organization.
Hess Steel Corporation, Baltimore, Md., gun forgings.	G523-303C; Mar. 8, 1918.	Mar. 8, 1918	Steel company	431,000.00	2,560,000.00	Same as above; Government agreeing to remove facilities within reasonable time after war.	Good reputation and experience.
Bethlehem Steel Co., South Bethlehem, Pa., several orders, guns, carriages, and forgings.	14; Apr. 13, 1917 15; May 18, 1917 17; May 21, 1917 18; May 21, 1917 22; Feb. 17, 1916 25; Jan. 7, 1917 54; Oct. 20, 1916 115; Oct. 20, 1916 477; Jan. 26, 1918 [illegible]C; Apr. 13, 1918. [illegible]C; Jan. 18, 1918. G963-3[illegible]C; Nov. 21, 1917 g. c. f. 43; Feb. 16, 1917 GC-130; Sept. 1, 1917 G-1007; May 21, 1917	Apr. 13, 1917 May 18, 1917 May 21, 1917 May 21, 1917 Feb. 17, 1916 Jan. 8, 1917 Oct. 20, 1916 Oct. 20, 1916 Jan. 26, 1918 Apr. 13, 1918 Jan. 18, 1918 Nov. 21, 1917 Feb. 16, 1917 Sept. 1, 1917 May 22, 1917	Ordnance plant	1,511,000.00	75,000,000.00	Increased facilities in the form of increased profits and belong to contractor.	Ordnance plant.
American Bridge Co., Gary, Ind., gun forgings.	G929-3[illegible]C; Mar. —, 1918	Mar. —, 1918	Bridge builders	2,000,000.00	6,750,000.00	do	Good organization.

Dayton Steel Foundry Co., Dayton, Ohio, Steel Works.	CF-417; Dec. 22, 1917..	Jan. 9, 1918	Rubber tire assembling shop.	7,200.00	545,811.50	Fixed price; the additional facilities are in a building which is to belong to the contractor after close of contract; contractor to assume $4,200 of such cost.	Contractor already a manufacturer of steel wheels in connection with tires.
J. G. Brill Co., Philadelphia, Pa., Artillery vehicles.	CF309; Sept. 25, 1917...	Oct. 27, 1917	Car shop.............	125,000.00	3,275,000.00	Cost plus fixed profit which allowance for increased facilities, which facilities belong to the Government, and are owned by Government at end of contract; Government to dispose of facilities at end of war.	Plant adapted for these vehicles.
Willys Overland Co., Toledo, Ohio, gun carriages.	G42991-448C; Nov. 3, 1917	Dec. 1, 1917	Automobile manufacturer.	600,000.00	7,500,000.00	Fixed-price contracts wherein increased facilities are furnished and owned by the Government and which are retained by the Government after the execution of contract.	Able organization; able to undertake work.
Ford Motor Co., Detroit, Mich., caissons.	CF402; Dec. 15, 1917....	Dec. 20, 1917	.....do................	75,000.00	12,986,000.00	Cost plus percentage contracts with the maximum profit fixed and increased facilities furnished, which the Government owns both during and after execution of contract.	Fine organization and reputation for accomplishing results.
Poole Engine & Machine Co., Baltimore, Md.	P8022-691C; June 10, 1918.	June 11, 1918	Machine shop.........	26,000.00	718,355.00	Improvements owned by contractor, who is to repay Government.	This order for artillery wheels.
Studebaker Corporation, Detroit, Mich., and South Bend, Ind.	CF378; Dec. 3, 1917....	Dec. 19, 1917	Vehicle manufacturers.	200,470.00	1,899,530.00	Improvements belong to United States.	Do.
Kelsey Wheel Co., Detroit, Mich.	CF474; Jan. 8, 1918....	Jan. 25, 1918	Wheel manufacturers.	35,000.00	3,127,706.00	Improvements property of contractor.	Do.
Do....................	CF471; Jan. 7, 1918....	Jan. 24, 1918	.....do...............	45,000.00	1,123,308.90	.....do....................	Do.
Dayton Steel Foundry Co., Dayton, Ohio.	CF417; Dec. 22, 1917...	Jan. 9, 1918	Steel wheel manufacturers.	3,000.00	559,846.40	.....do....................	Do.
Otis Elevator Co., Chicago, Ill., recuperators for 9.5 howitzers, tools, and accessories.	CF388; Dec. 15, 1917...	Dec. 22, 1917	Machining and assembling.	1,650,000.00	12,842,500.00	Cost plus fixed profit, with allowance for increased facilities, which facilities belong to the Government and are owned by the Government at end of contract.	Difficult work, for which this company had a suitable plant and organization.

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[1] Original order C. F. 367.

Artillery contracts—Continued.

Contractor.	Authority to proceed.	Date of order.	Character of plant.	Investment increased facilities.	Value of contract.	Terms and conditions.	Remarks.
Studebaker Corporation, Detroit, Mich., 4.7 gun carriage.	CF409; Dec. 21, 1917	Dec. 21, 1917	Machining and assembling.	$500,000.00	$3,150,000.00	Cost plus fixed profit, with allowance for increased facilities, which facilities belong to the Government and are owned by the Government at end of contract.	This company had the organization to handle the contract and needed less increased facilities than anyone else known to the department.
New York Air Brake Co., Watertown, N. Y., 75 mm. gun carriages.	CF12; June 8, 1917	June 8, 1917	do	1,000,000.00	1,975,000.00	do	They were bidders and were considered by the War Industries Board to have a suitable organization at time it was almost impossible to interest firm in this work.
Dodge Bros., Detroit, Mich., 155 mm. howitzer and gun (Filloux) recuperators.	CF339; Oct. 27, 1917	Nov. 1, 1917	do	7,500,000.00	17,500,000.00	do	Organization considered to be the best obtainable.
Minneapolis Steel & Machinery Co., Minneapolis, Minn., 155 mm. gun (Filloux) carriages.	CF310; Nov. 2, 1917	Nov. 30, 1917	do	1,681,443.00	18,125,488.00	do	Good organization and equipment, and favorable labor conditions.
Standard Steel Car Co., Hammond, Ind., 9.5 howitzer carriages.	CF331; Nov. 16, 1917 (teleg.).	Nov. 16, 1917	do	4,000,000.00	42,000,000.00	do	Good organization.
Walter Scott Co., Plainfield, N. J., 4.7 gun carriages.	CF125; July 12, 1917	July 12, 1917	do	250,000.00	2,500,000.00	do	Company was willing to take on the contracts; at the time it was practically impossible to interest anyone in Government work.
Mosler Safe Co., Hamilton, Ohio; 155 mm. howitzer carriages.	CF311; Oct. 3, 1917	Nov. 1, 1917	do	350,000.00	12,437,900.00	do	Good organization and equipment; also good labor conditions.
Singer Machine Co., Elizabethport, N. J., 75 mm. recoils.	P4560-451C; Mar. 13, 1918.	Mar. 26, 1918	do	[1] 1,000,000.00	8,000,000.00	do	Fine organization, and a very large equipment available at once suitable for part of the work.
Standard Steel Car Co., Worcester, Mass., 155 mm. howitzer carriages.	CF313; Oct. 24, 1917	Oct. 29, 1917	do	1,040,000.00	13,180,000.00	do	Good organization and equipment; also good labor conditions.

Rock Island Arsenal, Rock Island, Ill., 4.7 gun recoil mechanisms.	CF436; Nov. 24, 1917...	Jan. 11, 1918	Arsenal..............	500,000.00	713,000.00	Government plant........	
Rock Island Arsenal, Rock Island, Ill., recuperators for 75 mm. guns.	CF398; Dec. 6, 1917...	Dec. 6, 1917	.....do...............	1,700,000.00	2,500,000.00	.....do..................	
Watertown Arsenal, Watertown, Mass., 9.5 howitzer carriages.	CF239; Sept. 1, 1917...	Sept. 1, 1917	.....do...............	500,000.00	17,550,000.00	.....do..................	
Chalkis Manufacturing Co., Detroit, Mich., finished guns.	GC118; Aug. 29, 1917...	Sept. 11, 1917	Machining and assembling.	480,000.00	1,785,000.00	Government plant, except land.	Organized to do this work. Hugh Chalmers organization.
United States Steel Corporation, Nevilles Island, Pa., large guns, complete.	....	....	No plant..............	(2)	(3)	Government plant.......	Fine organization.

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[1] More or less.

[2] Cost.

[3] Cost with no profit.

Contracts providing for the construction of Government-owned plants for the manufacture of shell.

[The earliest date is one of authorization. The latest date is one contract bears. Where only one date is given, it is the date of the contract.]

Name of contractor.	Character of plant.	Location of plant.	Investment by Government in plants or increased manufacturing facilities.	Operation.	Quantity.	Price per shell.	Terms and conditions for construction of plant or increasing manufacturing facilities.	Remarks.
American International Corporation; Oct. 1, 1917; Nov. 22, 1917.	Forging.......	Rochester, N. Y....	$1,950,000.00	Forging 75 m/m shell.	4,000,000	[1] $0.42½ [2] .50	The contract contemplates the erection of a complete plant consisting of buildings, equipment, machinery, tools, and other facilities for the purpose of finishing contract. The total cost of such to the amount of $1,950,000 to be paid for by the Government. The title of which shall invest in the Government.	
Mead, Morrison & Co.; Dec. 7, 1917; Dec. 12, 1917.	.....do........	East Boston, Mass..	302,886.78	Forging 155 m/m	300,000	2.55	The United States to pay for and take title to this now building and equipment.	Building, $29,400; equipment, $273,486.78.

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[1] Scrapnel.

[2] High explosive shell.

Contracts providing for the construction of Government-owned plants for the manufacture of shell—Continued.

Name of contractor.	Character of plant.	Location of plant.	Investment by Government in plants or increased manufacturing facilities.	Operation.	Quantity.	Price per shell.	Terms and conditions for construction of plant or increasing manufacturing facilities.	Remarks.
Bartlett-Hayward Co.; Jan. 19, 1918; Jan. 25, 1918.	Machining and assembling.	Baltimore, Md......	2,200,000.00	Machining and assembling 155 m/m.	610,000	$11.50	New buildings and equipment to be erected on land owned by contractor at a cost not to exceed $2,200,000; United States to pay rental at 5 per cent on the land during occupancy.	Buildings and equipment to belong to United States.
Watertown Arsenal; Apr. 29, 1918.	Forging.......	Watertown, Mass...	110,000.00	Forging 12-inch S. C. gun.	15,000	75.00	Government arsenal........	Advance covers additional installations and equipment as scheduled in requisition.
Hydraulic Pressed Steel Co.; Nov. 13, 1917; Dec. 11, 1917.	.....do........	Cleveland, Ohio.....	1,793,000.00	Forging 75 m/m...	4,000,000	.60	United States to take title..	
Curtis & Co. Manufacturing Co.; 155 m/m shell; G779-428A; Nov. 3, 1917; Nov. 3, 1917.	....do........	St. Louis, Mo.......	174,544.53 75,000.00 45,200.00	Forging 155 m/m shell.	500,000	2.75	United States to purchase old plant valued at $75,000 and to pay cost for new building and equipment, estimated at $174,544.53; both to remain the property of the United States.	The item of $45,200 was an additional allowance for machine, tools, etc., first estimate being too low.
Pressed Steel Car Co.; G1732-957A; 6-inch shell; Dec. 31, 1917.	.....do........	Chicago, Ill.........	300,000.00	Forgings 6-inch shell.	195,000	2.60	United States to pay for the new buildings and equipment amounting to $300,000, in equal monthly installments; contractor to repurchase the building at appraised value from the United States at end of war.	
Winslow Bros.; P8199; 155 m/m shell; May 20, 1918.	Machining....	.....do.............	836,503.07	Machining 155 m/m shell.	400,000	9.00	United States to pay for additional equipment at cost, not to exceed $836,503.07; to become the property of the United States.	
Detroit shell; G1961-1060A; 155 m/m shell; Jan. 8, 1918.	Machining....	Detroit, Mich.......	1,692,400.00 77,800.00	Machining........	600,000	9.50	United States to pay for additional equipment at cost, not to exceed $1,692,400;	Price of $9.50 is estimated and includes profit; as

							to become the property of the United States; in addition the United States is to pay $77,800 as a special depreciation allowance on buildings.	this is a "Cost plus fixed profit adjustable" contract.
Symington Machine Corporation; Dec. 17, 1917; Dec. 19, 1917.	Machining and assembling.	Rochester, N. Y.....	1,500,000.00	Machining 75 m/m.	2,000,000	$2.05	Upon completion of plant the approved cost of same to be deducted from the total amount of $4,100,000; the remainder to be divided by 2,000,000 (total number of shell), which will give the exact unit price to be paid the contractor.	The allowance of $1,500,000 for buildings and equipment is included in the price of 2.05 per shell. Title to plant and equipment to go to the United States.
Twin City Forge & Foundry Co.; Jan. 25, 1918; Jan. 26, 1918.	Forging and machining.	Stillwater, Minn....	420,000.00	Machining 155 m/m.	225,000	11.50	Increased facilities in an amount not to exceed $420,000, or to be purchased and provided by the contractor, and to be paid for and to become the property of the Government.	
American Car & Foundry Co.; Oct. 16, 1917; Nov. 7, 1918.	.....do........	Detroit, Mich., and Depew, N. Y.	822,285.00	Forging 155 m/m..	1,750,000	2.75	Increased facilities in an amount not to exceed $2,468,635, or to be purchased and provided by the contractor, and to be paid for and to become the property of the Government.	
American Brake Shoe & Foundry Co., Oct. 6, 1917; Oct. 30, 1917.	.....do........	Erie, Pa............	1,125,000.00	Machining 155 m/m.	750,000	10.50	Increased facilities in an amount not to exceed $1,125,000, or to be purchased and provided by the contractor and to be paid for and to become the property of the Government.	This contract also provides for the payment by the Government of $502,500 to provide for housing facilities, or at the rate of 6 cents and 7 cents per shell. "Cost-plus contract" price mentioned is base cost.
W. J. Oliver Manufacturing Co.; May 9, 1917; Oct. 8, 1917.	.....do........	Knoxville, Tenn....	275,300.00	.....do............	100,000	11.00	Increased facilities in an amount not to exceed $275,300, or to be purchased and provided by the contractor and to be paid for and to become the property of the Government.	

Contracts providing for the construction of Government-owned plants for the manufacture of shell—Continued.

Name of contractor.	Character of plant.	Location of plant.	Investment by Government in plants or increased manufacturing facilities.	Operation.	Quantity.	Price per shell.	Terms and conditions for construction of plant or increasing manufacturing facilities.	Remarks.
Twin City Forge & Foundry Co.; Jan. 4, 1918.	Forging and machining.	Stillwater, Minn.	$675,882.00	Forging 155 m/m.	425,000	$2.30	$675,882, as per above.	
New York Air Brake Co.; Oct. 9, 1917; Nov. 13, 1917.	...do...	Watertown, N. Y.	525,000.00	Machining 155 m/m.	350,000	11.50	$525,000, as per above.	
International Arms & Fuze Co.; Nov. 16, 1917; Nov. 25, 1917.	...do...	Bloomfield, N. J.	750,000.00	...do...	500,000	11.50	$750,000, as per above.	
Wagner Electric & Manufacturing Co.; Nov. 22, 1917; Dec. 18, 1917.	...do...	St. Louis County, Mo.	450,000.00	...do...	300,000	11.00	$450,000, as per above.	
Pullman Co.; Jan. 29, 1918.	...do...	Chicago, Ill.	800,000.00	...do...	300,000	10.00 10.50	$800,000, as per above.	100,000 at $10.50 per shell; 200,000 at $10 per shell.
Templars Motors Corporation; Dec. 7, 1917; Dec. 13, 1917.	...do...	Cleveland, Ohio.	60,000.00	...do...	150,000	11.50	$60,000, as per above.	
Standard Sanitary Manufacturing Co.; Nov. 27, 1917; Mar. 15, 1918.	...do...	Pittsburgh, Pa.	160,000.00	...do...	150,000	11.451	$160,000, as per above.	
Westinghouse Electric & Manufacturing Co.; Jan. 4, 1918.	Assembling, forging, and machining.	Shadyside, Pa.	850,000.00	Machining 6-inch shell.	350,000	10.40	Increased facilities in an amount not to exceed $850,100 are to be purchased and provided by the contractor and to be paid for by and to become the property of the Government.	
American Car & Foundry Co.; Dec. 3, 1917; Dec. 10, 1917.	Machining, manufacturing and forging.	Detroit, Mich.	120,000.00	Forging 9.5-inch shell.	90,000	8.25	$120,000 as per above.	
Deep Drawn Metal Corporation, Dec. 21, 1917.	Assembling, forging, and machining.	Brooklyn, N. Y.	185,000.00	Manufacturing and assembly booster cases.	1,865,000	.36	$185,000, as per above.	
American Steel Foundries Co.; Jan. 30, 1918.	...do...	Chicago, Ill.	334,000.00	Forging 9.2-inch shell.	120,000	6.90	$334,000, as per above.	
				Forging 9.5-inch shell.	80,000	7.65		

Worthington Pump & Machinery Corporation; Nov. 13, 1917; Dec. 31, 1917.	do	Hazelton, Pa.	1,622,488.00	Machining 75 m/m	1,900,000	2.15	$1,622,488, as per above	
Bartlett-Hayward Co.; Dec. 17, 1917.	do	Baltimore, Md.	2,000,000.00	Manufacturing of complete rounds shell.	[1] 3,000,000 [2] 200,000 [3] 110,000 [4] 40,000		$2,000,000, as per above	Cost — plus contracts.
Detroit Shell Co.; Jan. 8, 1918; Feb. 8, 1918.	do	Detroit, Mich.	1,692,400.00	Machining 4.7-inch.	600,000		$1,692,400, as per above	Cost — plus contract.
Jackson Munitions Corporation, Jan. 7, 1918.	do	Jackson, Mich.	855,000.00	Machining 155-m/m. Machining 75-m/m.	177,500 1,000,000	10.00 2.00	$855,000, as per above	
Haroon Motors Corporation; Nov. 21, 1917.	do	Wayne, Mich.	280,000.00 420,000.00	Machining 155 m/m	200,000	11.50	The contract contemplates the need of $420,000 in increased facilities. Of this amount $280,000 may be paid as amortization allowance, in which case the increased facilities will become the property of the contractor or the Government has the option to pay the additional difference between $280,000 and $420,000, in which case the Government would take title to the increased facilities.	
New Home Sewing Machine Co.; May 21, 1918.	do	Orange, Mass.	675,100.00	do	200,000	9.00	Increased facilities in an amount not to exceed $675,100 are to be purchased and provided by the contractor and to be paid for by and to become property of the Government.	

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[1] 75 m/m.
[2] 4.7-inch.
[3] 2.95-inch.
[4] 3.8-inch.

Contracts providing for the construction of Government-owned plants for the manufacture of shell—Continued.

Name of contractor.	Character of plant.	Location of plant.	Investment by Government in plants or increased manufacturing facilities.	Operation.	Quantity.	Price per shell.	Terms and conditions for construction of plant or increasing manufacturing facilities.	Remarks.
Chicago Ry. Equipment Co.; Jan. 31, 1918; Mar. 16, 1918.	Forging	Chicago, Ill.	$140,000.00	Forging 155 m/m.	400,000	$2.55	The contract contemplates the purchase and installation of additional equipment to the amount of $240,000. The Government agrees to assist in the purchase of this equipment up to but not exceeding, $140,000, of which $125,000 is to be spent for tangible and movable equipment and $15,000 in installation. The United States will take title to the tangible equipment represented by the $125,000 expenditure.	
Wm. Wharton, Jr., & Co.; Oct. 30, 1917; Jan. 3, 1918.	do	Easton, Pa.	146,418.00	do	200,000	2.60	Increased facilities in an amount not to exceed $146,418 are to be purchased and provided by the contractor and to be paid for by and to become property of the Government.	
North American Motors Co.; Nov. 8, 1917; Nov. 8, 1917.	Machining	Pottstown, Pa.	140,000.00	Machining 155 m/m	70,000	11.50	$140,000, as per above.	

American Clay & Machinery Co.: Nov. 7, 1917; Jan. 14, 1918.	.....do........	Bucyrus, Ohio; Chicago, Ill.	980,000.00	.....do............	75,000	11.50	The contract provides for the acquisition and installation and special equipment for this contract the cost of which is estimated at $700,000. The United States is to pay for such equipment and to become the owner thereof. The contract also contemplates the erection of suitable buildings for the carrying out of this contract at a cost of $245,000. The United States will allow the contractor as partial amortization upon cost of such building 50 per cent. It is further agreed that in no event the United States be required to pay on either of the above items more than $980,000.
Moon Motors Car Co.; May 8, 1918.	.....do........	St. Louis, Mo........	577,500.00	.....do............	200,000	9.00	Increased facilities in an amount not to exceed $577,500 are to be purchased and provided by the contractor and to be paid for by and to become the property of the Government.
Grant Motor Car Co.; May 9, 1918	.....do........	Findlay, Ohio.......	758,550.00	.....do............	260,000	9.00	$758,550, as per above........
Winslow Bros. Co.; Dec. 28, 1917, Mar. 6, 1918.	.....do........	Chicago, Ill..........	262,500.00	.....do............	200,000	11.00	$262,500, as per above........
American Car & Foundry Co.: Nov. 8, 1917; Jan. 22, 1918.	.....do........	Detroit, Mich.; Depew, N. Y.	1,646,350.00	.....do............	970,000	11.50	$1,646,350, as per above......

Contracts in which substantial facilities have been provided by the Government for the manufacture of shells, the Government paying a percentage of cost of such facilities and the manufacturer becoming the owner thereof.

Name of contractor.	Character of plant.	Location of plant.	Investment by Government in plants or increased manufacturing facilities.	Operation.	Quantity.	Price per shell.	Terms and conditions for construction of plant or increasing manufacturing facilities.	Remarks.
Southern Machine Co.; Jan. 7, 1918.	Machining, assembling, and forging.	Chattanooga, Tenn..	$7,800	Machining 6-inch shell.	270,000	$11.00	This is for new equipment necessary in making 70,000 gas shell included in this total of 270,000.	Title to remain with contractor. This $7,800 is included in the new price of $11 each. This price also includes $42,000 worth pf new equipment to be paid for and retained by the contractor.
A. P. Smith Manufacturing Co.; Dec. 23, 1918; Mar. 9, 1918.	.....do.........	East Orange, N. J...	17,250	Machining 240 m/m.	25,000	25.69	Contractor has title..........	
New York Air Brake Co.; Nov. 13, 1917; Nov. 13, 1917.	.....do.........	Watertown, N. Y...	150,000	Forging 75 m/m...	2,000,000	.55	United States not to take title.	Total amount of additional equipment, $352,750. Amount to be amortized by Government $150,000.
American Can Co.; Apr. 13, 1918.	.....do.........	Kensington, N. J....	294,750	Loading, assembling, and packing 75 m/m shrapnel.	1,100,000	.70	.....do......................	
American Rolling Mills Co.; Nov. 3, 1917; Nov. 1, 1917.	.....do.........	Middletown, Ohio...	100,000	Forging 155 m/m.	500,000	2.75	The contract provides that the Government pay 20 cents on each shell to cover amortization of increased facilities required.	
New York Air Brake Co.; Oct. 10, 1917; Nov. 2. 1917.	.....do.........	Watertown, N. Y...	70,000	.....do............	350,000	2.75	.....do......................	
New York Air Brake Co.; Nov. 13, 1917; Nov. 13. 1917.	.....do.........	.....do..............	551,520	Machining 75 m/m.	1,300,000	1.80	The contract contemplates the acquisition of increased facilities to the amount of approximately $551,520. of which cost the Government will pay the contractor 59 per cent. Ownership of such equipment to be in the contractor.	

Contracts in which substantial facilities have been provided by the Government for the manufacture of shell, the Government retaining ownership of certain of such facilities and the manufacturer becoming the owner of certain of such facilities.

Name of contractor.	Character of plant.	Location of plant.	Investment by Government in plants or increased manufacturing facilities.	Operation.	Quantity.	Price per shell.	Terms and conditions for construction of plant or increasing manufacturing facilities.	Remarks.
Curtis & Co. Manufacturing Co.; Mar. 7, 1918; Mar. 8, 1918.	Assembling, forging, and machining.	St. Louis County, Mo.	$166,555.00	Forging 9.5-inch and 8-inch shell.	320,000	(1)	This contract provides that the Government shall pay the cost of increased facilities classified as follows: Tangible equipment, $114,555; intangible expense items, $25,000—both set forth in Schedule 1, attached to the contract. All of the equipment, machinery, tools, and other increased facilities of a tangible nature to become the property of the Government.	
Snead & Co. Iron Works; Nov. 13, 1917.	.....do........	Jersey City, N. J....	[2] 65,000.00	Machining 75 m/m.	500,000	$2.00	The contract provides that all equipment, machinery, tools, and other increased facilities to the value of $65,000, paid for by the United States, shall become the property of the United States; also provides that the Government shall pay the contractor 38 per cent of all items of cost for increased facilities above the sum of $65,000, the estimated cost of all increased facilities being approximated at $175,000.	

[1] $8.75 for 9.5-inch; $6 for 8-inch.

[2] And condition thereto 38 per cent of all items of cost of increased facilities over and above a sum of $65,000, but not exceeding $175,000.

Contracts in which substantial facilities have been provided by the Government for the manufacture of shell, the Government retaining ownership of certain of such facilities, and the manufacturer becoming the owner of certain of such facilities—Continued.

Name of contractor.	Character of plant.	Location of plant.	Investment by Government in plants or increased manufacturing facilities.	Operation.	Quantity.	Price per shell.	Terms and conditions for construction of plant or increasing manufacturing facilities.	Remarks.
American Brake Shoe & Foundry Co.	Assembling, forging, and machining.	Erie, Pa.	$575,000.00	Machining 9.2-inch.	250,000	$13.71	Increased facilities consisting of machinery, tools, and other manufacturing facilities to an amount estimated at $325,000 is to be provided by the contractor and to be paid for and become the property of the Government. The contract also provides for the expenditure by the Government of approximately $250,000 for housing facilities for the employees of the contractor.	"Cost-plus" contract.

trench warfare items.

Name of contractor.	Date.	Character of plant.	Location.	Investment by Government in plants or increased loading facilities.	Operation.	Quantity.	Price.	Remarks.
Atlantic Loading Co	Dec. 11, 1917	High-explosive loading.	Hammonton, N. J	$9,766,600	Loading, assembling, and packing various sizes high-explosive shell; also adapter and booster casings plant.	5,930,000 shells, 6,000,000 adapters and booster casings.	Cost plus	War-Ord. G1285-706A; G1399-766A. Subsidiary of J. D. Evans & Co., and Electric Bond & Share Co. Capacity of 25,000 3-inch or 75 m/m shell, 12,500 6-inch or 155 m/m, 4,000 8-inch or larger per day. Also capacity of 50,000 hand grenades, 20,000 rifle grenades, 50,000 adapters and boosters per day.
Bethlehem Loading Co	Nov. 30, 1917	do	Mays Landing, N. J.; Reddington, Pa.; New Castle, Del.	9,700,000	Same as above	5,930,000 shells	do	War-Ord. G1178-645A; subsidiary of Bethlehem Steel Co. Same shell capacity as above.
Du Pont Engineering	Dec. 3, 1917	do	Penniman, Va	7,217,100	do	5,930,000 shells, 6,040,000 adapters and booster casings.	do	War-Ord. G1320-732A; P2337-1228A. Subsidiary of E. I. Du Pont de Nemours. Same shell and grenade capacity as Atlantic Loading Co., above.
T. A. Gillespie Loading Co.	Nov. 24, 1917	do	Morgan, N. J. (South Amboy).	10,445,018	do	9,750,000 shells	do	War-Ord. 1020-542A. Subsidiary of T. A. Gillespie Loading Co. Same shell capacity as above.
California Loading Co	Dec. 22, 1917	do	Old Bridge, N. J	700,000	Loading, assembling, and packing Pt. detonating fuzes and grenades.	17,000,000 fuzes of various marks.	do	War-Ord. 1606-870A. Subsidiary of California Cap Co. Capacity, 50,000 adapters and booster casings; 30,000 Pt. detonating fuzes; 50,000 hand grenades; 20,000 rifle grenades per day.
Marlin Rockwell Loading Co.	Mar. 1, 1918	do	Port Pern, Del	1,500,000	Loading, assembling, and packing various drop bombs.	750,000 bombs	do	War-Ord. P3542-1231TW Subsidiary of Marlin-Rockwell Co. Capacity of 5,000 bombs per day.

Contracts providing for the construction of Government-owned plants for the loading of high-explosive shells, fuzes, adapters, and booster casings, and trench warface items—Continued.

BAG-LOADING CONTRACTS.

Contract No. and date.	Contractor.	Character of plant.	Location of plant.	Investment.	Price.	Terms and conditions.	Remarks.
PLANT NO. 1.							
War-Ord. P3509-643E; Mar. 1, 1918.	Foundation Co. (Government-owned property).	Operating contract, Dupont Engineering Co., plant for loading, assembling, and packing 20,000 "charges" per day.	Tullytown, Pa	$5,000,000	Operating cost plus 10 per cent until such time as plant is running at 70 per cent capacity for a period of 2 consecutive weeks, at which time a definite cost to be determined on actual operation, which is to apply to the balance of the contract, which cost, determined in this manner, shall apply on everything produced over 25 per cent of the contract quantity.	Construction contract made with Foundation companies on basis of cost plus 10 per cent, which compensation includes engineering, overhead, etc.	The above contract is the first contract to be let for the loading of explosive charges in quantities. All charges heretofore produced were loaded at Picatinny Arsenal by hand, and at the time this contract was undertaken no one had any knowledge as to the method of producing these charges in quantities, nor did anyone have any idea as to what the cost would be. Considerable progress has been made as regards construction of the plant, which is very urgently needed and which will be ready for operation in a very short time.
PLANT NO. 2.							
War-Ord. 9050-960E; June 1, 1918.	....do........	....do..........	Richmond, Va.	$5,000,000	....do..............	....do..............	Do.
PLANT NO. 3.							
War-Ord. P-4303 682E; Mar. 15, 1918.	McArthur Bros.	....do..........	Woodbury, N. J.	$5,000,000	....do..............	....do..............	Do.

T. N. T. CONTRACT.

War-Ord. P2956-607E; Feb. 19, 1918.	Hercules Powder Co.	Self-contained plant, except as to toluol production for the purpose of nitrating toluol, with a capacity of 3,500,000 pounds T. N. T. per month.	Hercules, Cal..	Estimated value, $7,500,000, plus $4,400,000 amortization; total investment, $11,900,000.	Price of T. N. T. $0.435 per pound, which includes above amortization charges on 42,000,000 pounds; the price is fixed at 33 cents per pound on any quantity delivered over 42,000,000 pounds.	Contract is a fixed price contract and the deliveries are to commence in September, 1918, at the rate of 3,500,000 pounds per month. Deliveries will actually be made late July to early Ausust.	The above contract is especially attractive to the United States Government, because the Hercules Powder Co. have an excellent organization at Hercules, Cal., and have been producing large quantities of T. N. T. for French Government and for the United States Navy; they own the site, which is particularly adapted for production of this material; sufficient nitrating capacity for increased toluol production produced was very urgently needed. Labor conditions on the Pacific coast are very favorable, and climate is especially adaptable for all-year work.

Contracts providing for the construction of Government-owned plants for the loading of high-explosive shells, fuzes, adapters, and booster casings, and trench warfare items—Continued.

SILK CARTRIDGE CLOTH CONTRACT.

Contract No. and date.	Contractor.	Character of plant.	Location of plant.	Investment.	Price.	Terms and conditions.	Remarks.
War-Ord. G958-374E; Nov. 19, 1917.	Allied Silk Trading Corporation.	For the supply of silk cartridge cloth from various plants.	Office, 17 Madison Avenue, New York City.	No Government investments.	Cost, plus 7½ per cent, which was later reduced by mutual agreement to 3 per cent.	See No. 7............	The requirements of the Ordnance Department for silk cartridge cloth call for a grade of silk that is entirely different from the ordinary commercial silk and is of a higher technical nature; the quantity of silk cartridge cloth covered by this contract is a total of 6,900,000 yards, which is an unusually large quantity of silk and, in order to protect the Ordnance Department against any outside speculation, it was arranged to form a special company consisting of the 7 spun silk manufacturers of the country, to undertake this work; in this way all the necessary raw materials, consisting of waste silks, etc., were bought in the Far East without any material advance in price and were processed at the various spinning mills referred to above; the original compensation of 7½ per cent was to cover the Allied Silk Trading Corporation for all their expenses and the financing of this undertaking, which financing required considerable capital as money was not refunded to them until the finished silk was delivered; the Allied Silk Trading Corporation after operating this contract, found that in view of the prompt manner in which details were handled by Ordnance Department so that they could get their money without delay after the delivery of goods, agreed with the contracting officer that 7½ per cent compensation was too high and reduced compensation to 3 per cent.

AMMONIUM NITRATE CONTRACT.

War-Ord. G897-353E; Nov. 16, 1917.	Atlas Powder Co., Wilmington, Del.	Production of ammonium nitrate by the neutralization process; capacity, 5,000,000 pounds per month; total contracts, 60,000,000 pounds.	Reynolds, Pa., Hopatcong, N. J.; Senter, Mich.; Atlas, Mo. (sulphate in part).	No plant investment by the United States Government.	15 cents per pound, based on raw materials as follows: Nitrate of soda, $4.25 per hundred pounds; sulphuric acid, $28 per ton; NH_3 (ammonia) 10½ cents per pound.	Flat price contract with stipulated variations in price based on actual cost of raw materials as above.	This contract takes care of the entire capacity of the Atlas Powder Co. at various plants and the price is a very reasonable one, allowing but very little profit to the contractor. Similar contracts made with all other explosives manufacturers in the United States who have ammonium nitrate capacity as follows: G. R. McAbee Powder Works, Tunnelton, Pa., 5,600,000 pounds; Pennsylvania Trojan Powder Co., Allentown, Pa., 6,100,000 pounds; Grasselli Powder Co., works at Wyside, Pa., and New Castle, Pa., 7,200,000 pounds.
War-Ord. P2674-583E; Jan. 16, 1918.	.....do.........	For the production of ammonium nitrate by a process heretofore unknown in this country and developed in England, called the ammonium sulphate nitrate process for the production of ammonium nitrate from sulphite of ammonia and nitrate of soda.	Perryville, Md.	Estimated investment, $8,000,000.	Construction of plant on basis of cost plus 3½ per cent, not to exceed $200,000; operation cost, plus ½ cent per pound compensation.	This is an agency contract.	The above contract was arranged with the Atlas Powder Co. because they, at the request of the Ordnance Department, sent 4 of their engineers, with officers of the Ordnance Department, to England to make a special study of this process; the Atlas Powder Co. was selected as the best concern for this purpose because they are the largest producers of ammonium nitrate, and the project was entered into because of the very urgent need for greatly increased quantities of ammonium nitrate for use as shell filler by a process other than the usual method because of the scarcity of HN_3 (ammonia); the production of the plant is rated at 600,000 pounds per day and the plans are made so that the plant can be very easily increased to 1,200,000 pounds per day should requirements call for this increased quantity.

Attached report gives condensed information on 29 Government owned and controlled toluol gas stripping plants.

The Ordnance Department arranged with these several gas companies, without cost to the Government, to attach gas-stripping plants to the gas operations.

Contracts were let to contractors as indicated, on the following basis (condensed from contracts), terms and conditions of each contract practically as follows:

Contractor to be paid the actual and necessary cost of the work, and in addition a fee of 10 per cent of said construction cost, which shall include engineering, supervision other than local supervision at the plant to be constructed, administration and overhead expenses, services in connection with purchasing and expediting delivery of material necessary in the construction of the plant, accounting services at the central office, and profit.

NOTE.—In Bartlett-Hayward's contracts for erecting plants an additional 5 per cent charge was permitted where work was fabricated in their own shop at Baltimore.

Time of operation: An average of five months from date of contract gives an approximate time for beginning operation. All of these plants should be producing toluol October 15, 1918.

Government owned and controlled toluol gas-stripping plants.

Status.	Location.	War order number, cost, estimated production, name of contractor, and date of requisition for contract.
1	Consolidated Gas Co., 21st Street Works, New York City.	War-Ord-G-1054-390E; 20,000,000 cubic feet; $284,000; H. Koppers Co.; estimated toluol, 460,000 gallons; requisition for contract, Feb. 11, 1918.
2	Westchester Lighting Co., Pelham Works, Mount Vernon, N. Y.	War-Ord-G-995-383E; 6,000,000 cubic feet; $154,000; Bartlett-Hayward Co.; estimated toluol, 110,000 gallons; requisition for contract, Dec. 21, 1917.
3	Coal Products Manufacturing Co., Joliet Plant, Joliet, Ill.	War-Ord-G-1056-392E; 9,000,000 cubic feet; $168,000; Wilputte Coke Oven Co.; estimated toluol, 120,000 gallons; requisition for contract, Dec. 27, 1917.
4	Mutual Gas Light Co., New York City.	War-Ord-G-1045-386E; 8,000,000 cubic feet; $163,000; H. Koppers Co.; estimated toluol, 236,000 gallons; requisition for contract, Feb. 11, 1918.
5	Standard Gas Light Co., New York City.	War-Ord-G-1036-385E; 8,000,000 cubic feet; $163,000; H. Koppers Co.; estimated toluol, 235,000 gallons; requisition for contract, Dec. 27, 1917.
6	Central Union Gas Co., New York City.	War-Ord-G-1047-388E; 8,000,000 cubic feet; $177,000; H. Koppers Co.; estimated toluol 154,000 gallons; requisition for contract, Feb. 20, 1918.
7	New Amsterdam Gas Co., Ravenswood Works, New York City.	War-Ord-G-994-382E; 16,000,000 cubic feet; $262,000; Bartlett-Hayward Co.; estimated toluol, 350,000 gallons; requisition for contract, Jan. 2, 1918.
8	Astoria Light, Heat and Power Co., Astoria Works, New York City.	War-Ord-G-991-379E; 40,000,000 cubic feet; $644,000; Bartlett Hayward Co.; estimated toluol, 630,000 gallons; requisition for contract, Jan. 2, 1918.
9	Providence Gas Co., Providence, R. I.	War-Ord-C-1046-387E; 7,000,000 cubic feet; $156,881; H. Koppers Co.; estimated toluol, 132,000 gallons; requisition for contract, Dec. 27, 1918.
10	Brooklyn Union Gas Co., Nassau Works, Brooklyn, N. Y.	War-Ord-G-988-376E; 12,000,000 cubic feet; $235,000; Bartlett Hayward Co.; estimated toluol, 183,000 gallons; requisition for contract, Nov. 28, 1917.
11	Brooklyn Union Gas Co., Citizens Works, Brooklyn, N. Y.	War-Ord-G-992-388E; 7,000,000 cubic feet; $161,000; Bartlett Hayward Co.; estimated toluol, 195,000 gallons; requisition for contract, Jan. 2, 1918.
12	Brooklyn Union Gas Co., Metropolitan Works, Brooklyn, N. Y.	War-Ord-G-989-377E; 12,000,000 cubic feet; $235,000; Bartlett Hayward Co.; estimated toluol, 295,000 gallons; requisition for contract, Nov. 28, 1917.
13	Brooklyn Union Gas Co., Fulton Works, Brooklyn, N. Y.	War-Ord. G-993-381E; 7,000,000 cubic feet; $161,000; Bartlett Hayward Co.; estimated toluol, 136,000 gallons; requisition for contract, Dec. 28, 1917.
14	Brooklyn Union Gas Co., Williamsburg Works, Brooklyn, N. Y.	War-Ord-G-990-378E; 16,000,000 cubic feet; $293,000; Bartlett Hayward Co.; estimated toluol, 407,000 gallons; requisition for contract, Nov. 28, 1917.
15	Boston Consolidated Gas Co., Everett Works, Everett, Mass.	War-Ord-G-1775-468E; 14,000,000 cubic feet; $225,000; Bartlett Hayward Co.; estimated toluol, 220,000 gallons; requisition for contract, Dec. 31, 1917.
16	Detroit City Gas Co., Stations "A" and "B," Detroit, Mich.	War-Ord-C776-346E; 15,000,000 cubic feet; $301,129; Bartlett Hayward Co.; estimated toluol, 385,000 gallons; requisition for contract, Nov. 28, 1917.
17	Washington Gas Light Co., East Station, Washington, D. C.	War-Ord-P-5385-753E; 6,000,000 cubic feet; $143,300; H. Koppers Co.; estimated toluol, 100,000 gallons; requisition for contract, Apr. 5, 1918.
18	Elizabethtown Gas Light Co., Elizabeth, N. J.	War-Ord-P-5383-751E; 2,500,000 cubic feet; $100,000; Wilputte Coke Oven Corporation; estimated toluol, 45,000 gallons; requisition for contract, Apr. 5, 1918.
19	Utica Gas Co., Utica, N. Y.	War-Ord-P-5389, 757E; 1,500,000 cubic feet; $65,000; Wilputte Coke Oven Corporation; estimated toluol, 40,000 gallons; requisition for contract, Apr. 5, 1918.

Government owned and controlled toluol gas stripping plants—Continued.

Status.	Location.	War order number, cost, estimated production. name of contractor, and date of requisition for contract.
20	Municipal Gas Co., Albany, N. Y.	War-Ord-P-5386-754E; 2,100,000 cubic feet; $97,000; Wilputte Coke Oven Corporation; estimated toluol, 40,000 gallons; requisition for contract, Apr. 5, 1918.
21	Bridgeport Gas Light Co., Bridgeport, Conn.	War-Ord-P-5307-724E; 4,000,000 cubic feet; $113,000; Bartlett Hayward Co.; estimated toluol, 80,000 gallons per year; requisition for contract, Apr. 4, 1918.
22	New Haven Gas Light Co., New Haven, Conn.	War-Ord-P-7020-846E; 4,400,000 cubic feet; $110,000; H. Koppers Co.; estimated toluol, 78,000 gallons per year; requisition for contract, Apr. 5, 1918.
23	Denver Gas & Electric Light Co., Denver, Colo.	War-Ord-P-5387-755E; 5,000,000 cubic feet; $100,000; H. Koppers Co.; estimated toluol, 100,000 gallons per year; requisition for contract, Apr. 5, 1918.
24	Memphis Gas & Electric Light Co., Memphis, Tenn.	War-Ord-P-5384-752E; 2,500,000 cubic feet; $80,000; H. Koppers Co.; estimated toluol, 43,000 gallons; requisition for contract, May 4, 1918.
25	Seattle Lighting Co., Seattle, Wash.	War-Ord-P-7308-860E; 4,000,000 cubic feet; water gas; $125,000; H. Koppers Co.; estimated toluol, 80,000 gallons; requisition for contract, May 2, 1918.
26	New Orleans Gas Light Co., New Orleans, La.	War-Ord-P-7306-858E; 6,000,000 cubic feet; $140,000; H. Koppers Co.; estimated toluol 80,000 gallons; requisition for contract, May 2, 1918.
27	Minneapolis Gas Light Co., Minneapolis, Minn.	Company has constructed plant; now operating; estimated production, 90,000 gallons.
28	Omaha Gas Co., Omaha, Nebr.	Approved May 6, 1918; price $98,375; contract being written; estimated gallons toluol, 65,000.
29	Grand Rapids Gas Light Co., Grand Rapids, Mich.	War-Ord-P-8563, 928E; 3,750,000 cubic feet; $130,000 :Wilputte Coke Oven Corporation; estimated toluol 75,000 gallons; requisition for contract May 22, 1918.

War-Ord.-P5390-758E.

1. General Petroleum Co., toluol plant, Vernon, Cal.
2. Operating contract: General Petroleum Co., plant for cracking toluol from petroleum distillate.
3. Estimated amount, 2,000,000 gallons per annum.
4. Investment, $2,000,000 (rental of 20 acres of ground at $5,850 per annum, to be used for site for said plant controlled by United States).
5. Construction contract on basis of cost plus 10 per cent (said operating cost includes the actual cost of all labor and materials necessary to construction and equipment of said petroleum cracking plant for the production of pure toluol).
6. Operating contract: United States shall pay all actual costs of operation. No amortization and depreciation of plant was considered in this contract. Contractor shall be entitled to a commission of 5 per cent of proceeds on sale of products recovered, except toluol, and 2½ per cent for guaranteeing accounts.
7. Date of contract, April 5, 1918; possible date of operation, October 15, 1918.

NITRATE OF AMMONIA CONTRACT.

June 8, 1918.

1. P 2674-583E.
2. Atlas Powder Co., agency contract; Government-owned.
3. For construction and operation, construction at cost plus fee of 3½ per cent of entire cost of construction; total cost not to exceed $200,000.
4. Perryville, Md.
5. 100,000 tons nitrate of ammonia yearly by the direct process, namely, ammonium, sulphate, nitrate process.
6. Estimated cost of plant $8,000,000.
7. For operating, agent to be paid an operation fee equivalent to ¾ cent per pound for each pound of ammonium nitrate delivered up to December 31, 1919.
8. Dated February 15, 1918.
9. July 1, 1918.

TETRANITROANILINE.

JUNE 8, 1918.

WAR-ORD-G753-339E.

1. Calco Chemical Co., equipment owned by contractor; buildings by Government.
2. Construction and operation of plant; construction at cost plus 10 per cent.
3. Bound Brook, N. J.
4. 7,500 pounds daily until total of 1,000,000 pounds is delivered.
5. Estimated cost, $1,700,000.
6. For each pound of explosive delivered and accepted by the United States contractor to be paid profit of 12⅓ cents per pound. It is estimated that the cost price will be $1.2356 per pound, based on cost of raw materials. If when actual cost is determined it is found that the cost is less than $1.2356 per pound, the contractor's fee shall be increased 1 cent per pound for every 10 cents or every fraction that the cost is reduced. In no event, however, shall fee exceed 15⅓ cents per pound. In event that estimated cost exceeds $1.2356, the contractor's fee shall be decreased 1 cent per pound for every 10 cents or major fraction that the estimated cost is increased. but in no event is contractor's fee to be less than 9⅓ cents per pound.
7. December 20, 1917.
8. May, 1918.

CANADIAN EXPLOSIVES COMPANY.

War-Ord.-P2814-588E.

1. Date of contract, March —, 1918.
2. Increased facilities for the production of 10,875,000 pounds of T. N. T. at Noble, Ontario, Canada.
3. Contractor agrees to construct and provide additional equipment, buildings, etc., at their works at Noble, Ontario, and at Shand, British Columbia, to produce 10,875,000 pounds of T. N. T.
4. The United States Government to pay approximately $400,000 increased facilities cost at Noble, Ontario, and $150,000 increased facilities at Shand, British Columbia. The cost thereof to be paid by United States by amortization allowance of not more than 5 cents per pound on the total amount of T. N. T. contracted for.
5. Such increased facilities to become the property of the United States and to be removed by the United States without cost to the contractor two years after the close of the war.
6. Deliveries: Contractor agrees to deliver, commencing June, 1918, the entire amount of 10,875,000 before January 1, 1919. The maximum output to be reached during September, 1918, or at the rate of 1,740,000 pounds per month.
7. Fifty-five cents per pound, purchase price T. N. T. delivered to and accepted by the United States.

HERCULES POWDER CO.

War-Ord.-P2956-607E.

1. Date of contract, February —, 1918.
2. Construction of plant and manufacture of 42,000,000 pounds of T. N. T.
3. Place, Hercules, Cal.
4. Investment, $42,000,000.
5. This plant to be located on land leased by the Hercules Powder Co., adjacent to its present plant at Hercules, Cal. When completed it shall include all parts and facilities essential to the operation of the plant and a monthly capacity of approximately 3,500,000 pounds of T. N. T.
6. The contractor is to be paid the sum of 43.5 cents for each pound of T. N. T. delivered and accepted. The sum of 10.5 cents per pound is fixed as allowance for and toward partial amortization of equipment and the plant. When 42,000,000 pounds of T. N. T. have been delivered by the contractor and paid for, no further allowance shall be made for amortization and the price of all T. N. T. thereafter delivered shall be 33 cents per pound. Deliveries are to commence during the month of September, 1918, and continue at the rate of 3,500,000 pounds per month until total designated amount in contract has been shipped.

E. I. DU PONT DE NEMOURS & CO.

G1251-415E. No. 2, 10,000,000 pounds trinitrotoluol.

1. Contractor, E. I. Du Pont de Nemours & Co. Contract made for increased facilities and equipment at plant of contractor Barksdale, Wis.

2. To construct such new buildings and provide equipment, machinery, and other facilities, estimated cost $2,888,000, which cost shall be paid by the contractor and the increased plant facilities remain the property of the contractor.

3. Contractor agrees to deliver 10,000,000 pounds of T. N. T. beginning August 1, 1918, at the rate of 2,000,000 pounds per month, completing the amount before December 31, 1918.

4. Purchase price of 67 cents per pound for T. N. T. delivered to and accepted by the United States.

5. United States shall have the right to order at any time before the completion of this order, an additional 14,000,000 pounds of T. N. T. at 39 cents per pound, deliveries to be at the rate of 2,000,000 pounds per month from January 1 to July.

SILK SPINNING (CONTEMPLATED—NOT CONTRACTED FOR).

JUNE 7, 1918.

1. Allied Silk Trading Corporation, by its subcontractor, Woonsocket Spinning Co., Woonsocket, R. I.; Government owned property.

2. To be operated by Woonsocket Spinning Co., for spinning silk noil yarn for cartridge cloth, 60,000 pounds monthly.

3. Woonsocket, R. I.

4. $225,000, estimated cost.

5. Woonsocket Spinning Co. to receive price of 44 cents per pound for all raw stock converted into silk noil yarn.

6. Construction contract to be carried out by subcontractor, Woonsocket Spinning Co. on basis of cost plus 10 per cent, which compensation includes engineering, overhead building, materials, etc.

7. Above contract is merely contemplated and not closed, and is being negotiated because of lack of American facilities for spinning low grade waste into yarn for cartridge cloth. Plant would be able to operate somewhere near October 1, 1918.

BY-PRODUCT OVEN CONTRACTS.

JUNE 6, 1918.

War order, P6626-817E.

1. Indiana Coke & Gas Co.

2. The toluol and ammonia output of the entire plant for 1919, 1920, 1921, estimated at 165,126 gallons of toluol per annum and 2,889,705 pounds of ammonia per annum.

3. Terre Haute, Ind.; investment, $500,000.

4. Date of contract, April 24, 1918; date of operation, January 1, 1919, through December 31, 1921.

5. The contractor is to be paid $15 per gallon for toluol and 12½ cents per pound for the ammoniacal liquor. The said price to be based on NH_3 content.

6. The contractor is to erect 30 additional by-product ovens, and to enable him to do this the Ordnance Department agrees to advance the sum of $500,000, as mentioned above, on the approval of the War Credits Board. The sum of $500,000, with interest as determined by said board, is to be repaid by the contractor in accordance with such terms and conditions as may be agreed upon between it and the said board: *Provided, however*, That the full amount, with interest, shall be paid prior to January 1, 1921.

BY-PRODUCT OVEN CONTRACTS.

JUNE 6, 1918.

War order, P8243-914E.

1. Donner Union Coke Corporation; Donner Steel Co.; Buffalo Union Furnace Co. Government leases land from contractor at a rental of $10,000 per annum.

2. One hundred and fifty by-product coke-oven plants for the production of tuluol and ammonia sulphate, coke, gas, and tar.

3. Buffalo, N. Y.

4. Investment, $6,000,000; date of contract, May 16, 1918; date of operation, July 15, 1919, and six months after termination of the war.

Coke corporation will purchase all surplus gas at 10 cents per thousand cubic feet, all tar produced at the Government or prevailing market price; the Steel Co. to purchase 70 per cent of all coke at Government or the price of Connellsville coke f. o. b. plant; the Furnace Co. to purchase 30 per cent of all coke at the Government or the price of Connellsville coke f. o. b. plant; the Government is to take all the toluol and ammonia sulphate and other residuals as they require at such price or prices for the same as they shall from time to time fix.

The Coke Corporation is to receive 5 per cent commission and 2½ per cent for guaranteeing of accounts on all products marketed, except gas, coke, and tar, and the products required by the United States.

5. Plant to be purchased by the Coke Corporation upon 30 days' notice or the expiration of the term of this contract, and they shall pay such price upon such terms and conditions as shall be determined by a board of three appraisers.

MEMORANDUM OF ADDITIONAL FACILITIES FOR THE MANUFACTURE OF OS (CODE NAME).

June 6, 1918.

Contractor, Commercial Research Co.
Location, Niagara Falls.
Capacity of plant, approximately 10,000 pounds per day.
Estimated cost, $622,500.

General terms of contract.—Government to pay cost of plant not to exceed $620,000 and to rent with option to buy at a price not to exceed $2,500 not more than 6½ acres of land, upon which plant is to be built. The contractor agrees to produce 3,000,000 pounds of OS at a rate of an average of approximately 10,000 pounds per day commencing four months from date of acceptance of order.

Contract may be canceled by Government whenever it is deemed advisable.

Government will own plant.

MEMORANDUM OF ADDITIONAL FACILITIES FOR THE MANUFACTURE OF PHENOL.

June 6, 1918.

Contractor, Newport Mining Co.
Location, Carrollsville, Wis.
Capacity of plant, 3,600,000 pounds per month.
Estimated cost, $1,312,000.

General terms of contract.—Government will furnish $1,212,000 toward erection and construction of buildings and equipment and will buy a building already constructed. for the sum of $100,000. Payment for last will be made by the addition of 1 cent per pound for the first 10,000,000 pounds of phenol delivered, or in the event of cancellation, balance will be paid by the Government to the contractor. The contractor leases to the Government for $1 and other considerations, for duration of the contract and one year thereafter, the land to be occupied by buildings.

The contractor is to deliver 3,600,000 pounds per month commencing September, 1918, or earlier. In event of cancellation of contract by the Government contractor is to be paid as follows:

If cancellation is effected during construction of plant, but before 3,600,000 pounds of phenol have been delivered, $100,000; if more than 3,600,000 and less than 7,200,000 pounds have been delivered, $75,000 plus allowance for raw materials on hand; if more than 7,200,000 pounds and less than 10,800,000 pounds, $50,000 plus allowance for raw materials; if more than 10,800,000 pounds and less than 14,400,000 pounds, $25,000 plus allowance for raw materials.

The buildings and equipment will be owned by the Government.

MEMORANDUM OF ADDITIONAL FACILITIES FOR THE MANUFACTURE OF L_3.

June 6, 1918.

Contractor, Frank Hemingway.
Location, Bound Brook, N. J.
Capacity of plant, 10,000 pounds L_3 gas per day.
Estimated cost: Not to exceed $121,000.

General terms of contract.—The Government will pay all costs necessary for the erection, equipment and operation of the plant and the purchase or lease of land, entire cost not to exceed $120,000 for plant and $1,000 for land. The agent agrees to deliver 10,000 pounds of gas L_3 per day from time of completion of plant to end of the war at cost plus 10 per cent. Title to land and buildings, machinery, equipment, etc., shall vest in the Government but Government will remove from land not owned by the United States all such buildings, machinery, equipment, etc., within one year after completion of contract. No further mention of disposition of property appears in the contract.

MEMORANDUM OF ADDITIONAL FACILITIES FOR THE MANUFACTURE OF MINING SALTS.

JUNE 6, 1918.

Contractor, Dow Chemical Co.
Location, Midland, Mich.
Capacity of wells, 85,000 pounds per month.
Estimated cost: Not to exceed $500,000.

General terms of contract.—Government to pay all costs connected with drilling 17 wells, machinery, piping, etc., and delivery of brine to the Dow Chemical Co., total expenditure not to exceed $500,000. The property on which wells are dug shall be sold to the Government or given on long lease at a nominal figure. Contractor is to deliver 85,000 pounds mining salts per month as soon as wells are drilled and equipped.

The title to wells, equipment, etc., to vest in the Government, but should the Government determine to sell, the contractor shall have the right to acquire same at an appraised valuation.

MEMORANDUM OF ADDITIONAL FACILITIES FOR THE MANUFACTURE OF SULPHURIC ACID 60°.

JUNE 6, 1918.

Contractor, Fairmont Chemical Co.
Location, Fairmont, W. Va.
Capacity of plant, 750 tons per month (minimum).
Estimated cost, approximately $250,000.

General terms of contract.—The Government is to advance the contractor $50,000 to complete payments on construction work on his plant and to provide funds for raw materials and working capital. This amount to be paid back at the rate of $5 per ton of acid shipped.

The contractor is to deliver 750 tons per month throughout the year beginning June, 1918. The United States is to receive any tonnage produced in excess of 9,000 tons minimum.

Contractor is to own plant after advance of $50,000 is repaid as above.

MEMORANDUM OF ADDITIONAL FACILITIES FOR THE MANUFACTURE OF LIQUID CHLORINE.

JUNE 6, 1918.

Contractor, Dill & Collins.
Location, Philadelphia, Pa.
Capacity of plant (with increased facilities), 8.4 tons per day.
Estimated cost (of increase in facilities), $328,059.

General terms of contract.—The Government advances to the contractor the sum of $250,000, of which $150,000 is amortized in the price of liquid chlorine to be delivered, the contractor to be paid 5 cents per pound with additional 2 cents to go toward this amortization. After completing amortization, the contractor is to be paid 4 cents per pound, of which 2 cents will be paid back, to be credited against the balance of $100,000 due the Government.

The contractor is to furnish approximately 16,800 pounds of liquid chlorine per day for two years, or until termination of this contract by the Government.

The caustic soda generated is to be taken by the Government at 3½ cents per pound, or the Government is to share any profit which may be derived from the sale of caustic soda.

In the event of the termination of the contract at any time by the Government, the Government will cancel the balance, if any, of the $150,000 still due to be amortized, but the contractor is to pay to the United States the whole of the $100,000 above the $150,000 mentioned, with accrued interest, or of such part of the $100,000 as remains unpaid.

The contractor will retain title to all increased facilities.

MEMORANDUM OF ADDITIONAL FACILITIES FOR THE MANUFACTURE OF PHENOL.

JUNE 6, 1918.

Contractor, The Barrett Co.
Location, Frankford, Pa.
Capacity of plant, 2,000,000 pounds per month.
Estimated cost, $1,315,347.40.

General terms of contract.—The Government will pay $926,236 for the construction of the plant, and $138,935.40 for contingencies.

The contractor agrees to deliver phenol at the rate of 2,000,000 pounds per month, from December, 1918, to November, 1919, inclusive.

If contract should be canceled before 2,000,000 pounds of phenol are delivered, cost of construction of other items not covered by the above, not amounting to more than $250,176, shall be paid the contractor by the Government.

If the contract should be canceled before 4,000,000 pounds of phenol are delivered, the Government will pay the contractor $229,328; if less than 6,000,000 pounds are delivered, $208,480; if less than 8,000,000 pounds are delivered, $187,632; if less than 10,000,000 pounds are delivered, $166,784; if less than 12,000,000 pounds are delivered, $145,936; if less than 14,000,000 pounds are delivered, $125,088; if less than 16,000,000 pounds are delivered, $104,240; if less than 18,000,000 pounds are delivered, $83,392; if less than 20,000,000 pounds are delivered, $62,544; if less than 22,000,000 pounds are delivered, $41,696; if less than 34,000,000 pounds are delivered, $20,848.

In addition to the above sums stipulated, the United States will pay for raw materials on the ground.

At expiration of contract, the contractor will have the option of purchasing any part of the plant belonging to the United States at cost. In the event that the purchase is not made, the United States agrees to remove these improvements from the property of the contractor.

PICRIC ACID.

(War Order P2368–556E.)

1. Hooker Electro Chemical Co., Government owned.
2. Construction and operation, construction at cost plus 10 per cent.
3. Niagara Falls, N. Y.
4. Estimated cost, $225,000.
5. Two million pounds.
6. Operation at fixed price of $0.04 per pound, subject to adjustment as follows:

(*a*) When actual cost is less than $0.52 there shall be paid to the agent 50 per cent of the difference between the estimated cost and the actual cost.

(*b*) Agent's profit shall not exceed $0.06 per pound. If actual cost is in excess of estimated cost, the agent's profit shall be reduced by the amount of such excess, provided the agent's profit shall not be less than $0.02 per pound.

7. February 20, 1918.
8. Operations commence May, 1918.

PICRIC ACID.

(War Order, P7625–878E.)

1. Butterworth-Judson Corporation, Government owned.
2. Construction at cost.
3. Brunswick, Ga.
4. Cost of plant $7,000,000.
5. Seventy-two million pounds.
6. Fifty-three cents a pound, based on raw material cost.
7. Procurement order dated May 10, 1918.
8. Operation: The first half by October 15; second half by December 1, 1918.

PICRIC ACID, GOODRICH LOCKHART CO.

(War Order 783–347E.)

1. Increased facilities cost, $110,000. (Amendment now being made to above contract to increase quantity by 6,000,000 pounds, which will increase the amendment by $66,000.)

2. Cost of increased facilities to be paid by the United States.
3. Perth Amboy, N. J.
4. Ten million pounds, plus 6,000,000 covered by amendment.
5. $0.571 per pound to $0.011 per pound is charged for amortization and depreciation of increased plant and facilities of the contract.
6. December 1, 1917.
7. Began delivering December, 1917.

MEMORANDUM FOR ADDITIONAL FACILITIES FOR THE MANUFACTURE OF LIQUID CHLORINE.

MAY 27, 1918.

Contractor, Charleston Chlorine Co.

Location, Belle, W. Va.

Capacity of plant, 10 tons liquid chlorine per day.

Estimated cost, not to exceed $575,000.

General terms of contract.—The Government advances entire cost of plant, not to exceed $575,000. The contractor agrees to deliver to the Government 4,600 tons of liquid chlorine, commencing approximately 90 days from date of contract, at the rate of 10 tons per day, and also pays the Government $92,000 in cash, in consideration for which the Government turns over the plant to the contractor.

Should Government desire further deliveries of chlorine the contractor will have the option of delivering chlorine at a rate of 10 tons per day, at $45 per ton, sufficient to complete sum of $92,000. Further deliveries will be at $45 per ton; which rate will continue for the duration of the war, unless contract is sooner terminated by the Government.

PICRIC ACID.

(War order, P7571–868E.)

1. E. M. Davis Chemical Corporation—Government-owned.
2. Construction at cost.
3. Little Rock, Ark.
4. Cost of plant, $4,000,000.
5. 42,000,000 pounds.
6. Operation at actual cost plus compensation to contractor as follows:
   (*a*) Two cents per pound where cost is $0.51 or less.
   (*b*) One-third of the saving, provided it shall in no event exceed $0.02, thereby making a maximum profit possible of $0.04 per pound.
   (*c*) Two cents per pound, to decrease proportionately with increase of price between $0.51 and $0.53 per pound.
7. Procurement order dated May 10, 1918.
8. Operation to commence—first half by September 1, second half by October 1, 1918.

PICRIC ACID.

(War order, 7624–879E.)

1. Semet Solvay Co.—Government-owned.
2. Construction at cost.
3. Cost of plant, $3,500,000.
4. 60,000,000 pounds.
5. Operation at actual cost plus compensation as follows:
   (*a*) Two cents per pound.
   (*b*) Where cost is less than $0.50, one-third of the saving; provided it shall in no event exceed $0.02, thereby making a maximum profit possible, of $0.04 per pound.
6. Procurement order dated May 10, 1918.
7. To begin operations 2,500,000 pounds monthly by September 15, 1918, and to increase to 5,000,000 pounds by October 15, 1918.

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